

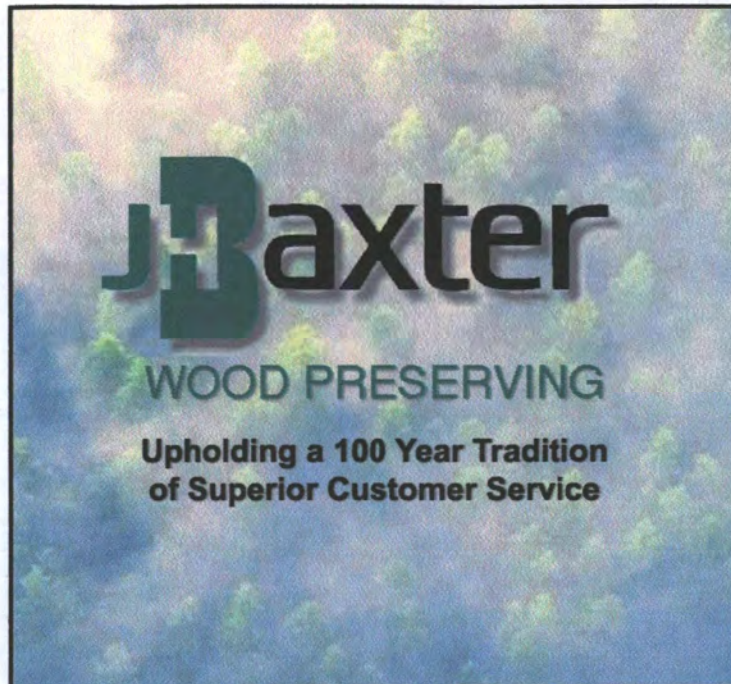
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Site Investigation Report

J.H. Baxter & Co. Wood Treating Facility
Arlington, Washington



Prepared for:

United States Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Prepared by:

J.H. Baxter Project Team
P.O. Box 10797
Eugene, Oregon 97440

April 14, 2005



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April 14, 2005

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Ms. Jan Palumbo, RCRA Project Manager
United States EPA, Region 10
1200 Sixth Avenue, Mail Stop WCM-121
Seattle, WA 98101

Subject: **Site Investigation Report**
J.H. BAXTER ARLINGTON FACILITY
Docket No. RCRA-10-2001-0086

Dear Ms. Palumbo:

Please find enclosed the Site Investigation Report for J.H. Baxter & Co.'s (Baxter's) Arlington, Washington facility. This report was developed and implemented pursuant to Paragraph 52 of the United States Environmental Protection Agency (EPA) Administrative Order on Consent (AOC) dated April 30, 2001.

The Site Investigation Report provides background information on the Arlington facility and outlines the results of the investigations performed to determine the nature and extent of chemicals of potential concern in site media. This report is designed to meet the objectives and general requirements of the EPA-approved *Site Investigation Work Plan, Revision 2*, and subsequent addenda, as well as the AOC.

We trust this report meets the intent of the Site Investigation per Paragraph 52 of the AOC. If you have any questions, please do not hesitate to contact me at (541) 689-3801.

Sincerely,

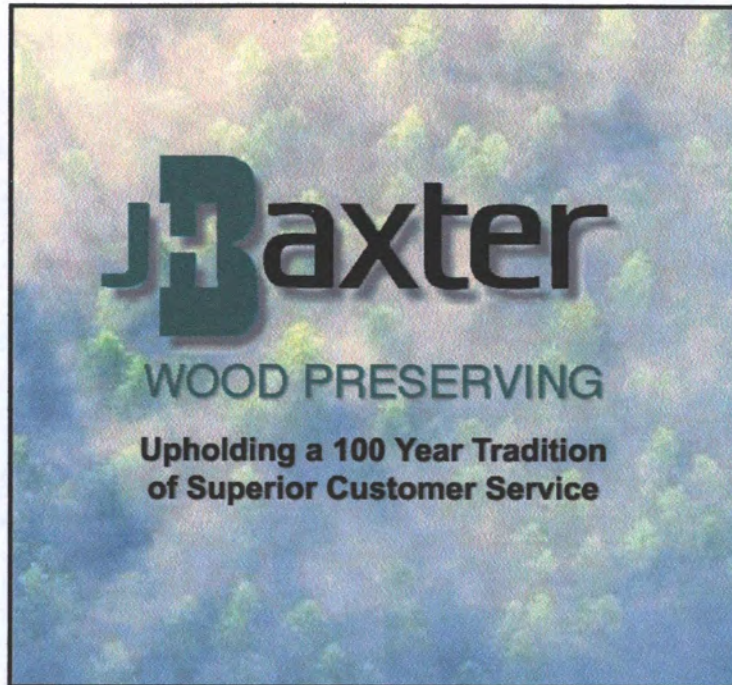
A handwritten signature in black ink that reads 'RueAnn Thomas'.

RueAnn Thomas
Environmental Programs Director

cc: Georgia Baxter, J. H. Baxter & Co.
Mary Larson, J. H. Baxter & Co.
J. Stephen Barnett, Premier Environmental Services, Inc.



Site Investigation Report
J.H. Baxter & Co. Wood Treating Facility
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1200 Sixth Avenue
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Prepared by:

J.H. Baxter Project Team
P.O. Box 10797
Eugene, Oregon 97440

April 14, 2005



Certification Statement

Site Investigation Report

**J.H. Baxter & Co. Wood Treating Facility
Arlington, Washington**

"I certify that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to evaluate the information submitted. I certify that the information contained in or accompanying this submittal is true, accurate and complete. As to those identified portions(s) of this submittal for which I cannot personally verify the accuracy, I certify that this submittal and all attachments were prepared in accordance with procedures designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those directly responsible for gathering the information, or the immediate supervisor of such person(s), the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature: RueAnn Thomas
RueAnn Thomas
Environmental Programs Director
J.H. Baxter & Co.

Date: 4-14-05

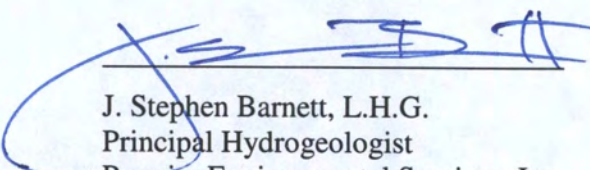
Site Investigation Report
J.H. Baxter & Co. Wood Treating Facility
Arlington, Washington

April 14, 2005

The J. H. Baxter & Co. (Baxter) Project Team (Baxter and Premier Environmental Services, Inc.) is submitting this Site Investigation Report for Baxter's facility in Arlington, Washington. This report was prepared by or performed under the direction of a State of Washington Licensed Hydrogeologist and Geologist. If you have any questions or comments concerning the report, please contact the individuals listed below.



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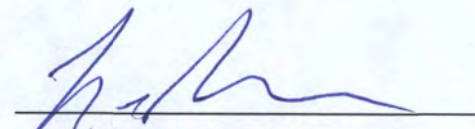

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Appendix B: Technical Memorandum – Ditch Improvements

Appendix C: Borehole and Well Logs

Appendix D: Air Quality Assessment Report

Appendix E: Quality Assurance Reviews

Acronyms and Abbreviations

Arlington facility	J.H. Baxter & Co. wood treating facility in Arlington, Washington
AKART	all known and reasonable methods of prevention, control, and treatment
AOC	Administrative Order on Consent
AOI	Area of Investigation
Baxter	J.H. Baxter & Co.
bgs	below ground surface
Butcher	Ted Butcher, Inc.
CAS	Columbia Analytical Services
CB	catch basin
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	contract lab procedure
COPC	chemical of potential concern
cPAH	carcinogenic PAH
CSM	Conceptual Site Model
CuNAP	copper naphthenate
DCP	dichlorophenol
DMR	Discharge Monitoring Report
DNAPL	dense nonaqueous phase liquid
DPT	direct push technology
DRO	diesel-range organics
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
FIFRA	Federal Insecticide Fungicide and Rodenticide Act
HDPE	high density polyethylene
HRMS	high resolution mass spectrometry
HSA	hollow stem auger
ISCST3	EPA Industrial Source Complex-Short Term
LNAPL	light nonaqueous phase liquid
NAPL	nonaqueous phase liquid
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollution Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PCBs	Polychlorinated biphenyls
PCDD	polychlorinated dibenzo- <i>p</i> -dioxins
PCDF	polychlorinated dibenzofurans
PCP	pentachlorophenol
PID	phototization detector

Premier	Premier Environmental Services, Inc.
PRG	EPA Region 9 Preliminary Remediation Goal
PRIME	Plume Rise Model Enhancements
PSCAA	Puget Sound Clean Air Agency
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RRO	residual-range organics
SADMP	Sampling and Analysis and Data Management Plan
SEPA	State Environmental Policy Act
SI	Site Investigation
SPLP	synthetic precipitation leaching procedure
SVOC	semivolatile organic compound
SWDP	State Waste Discharge Permit
SWTS	stormwater treatment system
TCDD	tetrachlorodibenzo-p-dioxin
TCP	trichlorophenol
TeCP	tetrachlorophenol
TEF	toxicity equivalent factors
TEQ	toxicity equivalent quotient
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TPH-D	total petroleum hydrocarbon as diesel range petroleum hydrocarbons
TPH-G	total petroleum hydrocarbon as gasoline range petroleum hydrocarbons
TPH-O	total petroleum hydrocarbon as oil range petroleum hydrocarbons
TSS	total suspended solids
WAC	Washington Administrative Code
WHO	World Health Organization

1 Introduction

The J.H. Baxter Project Team, consisting of J.H. Baxter & Co. (Baxter) and Premier Environmental Services, Inc. (Premier), has prepared this Site Investigation (SI) Report describing the results of the environmental investigation undertaken at Baxter's Arlington, Washington wood-treating facility (Arlington facility), located at 6520 188th Street NE (Figure 1-1).

This SI Report was developed and implemented pursuant to Paragraph 52 of the United States Environmental Protection Agency (EPA) Administrative Order on Consent (AOC) dated April 30, 2001 (EPA 2001a). All investigation activities were conducted in accordance with the *Site Investigation Work Plan, Revision 2* (Baxter 2002a). The soil, sediment, and groundwater investigations proposed in the *Site Investigation Work Plan* were approved by EPA on July 8, 2002 (EPA 2002a). The air portions of the SI were approved on March 18, 2003 (EPA 2003), following submittal of *Addendum A: Revised Air Quality Assessment* (Baxter 2003a).

The report provides background information on the Arlington facility and outlines the results of the investigations performed to determine the nature and extent of chemicals of potential concern (COPCs) in site media. This SI report is designed to meet the objectives and general requirements of the EPA-approved *SI Work Plan* and subsequent addenda, as well as the AOC.

The purpose of this document is to present the analytical data and provide a discussion regarding the nature and extent of COPCs at the Arlington facility. A detailed analysis of exposure pathways and potential risks from site-related COPCs is not included in this

document. These evaluations will be conducted as part of a risk assessment to be completed under separate cover.

1.1 Investigation Overview and Objectives

The approach taken during the SI incorporated the required elements from the AOC for the Arlington facility (EPA 2001a) and followed the scope of work of the EPA-approved *SI Work Plan* (Baxter 2002a). The SI was conducted using the protocols established or referenced in several guidance documents, including:

- *Resource Conservation and Recovery Act (RCRA) Facility Investigation Guidance Document, Volumes I-IV* (EPA 1989)
- *RCRA Groundwater Monitoring: Draft Technical Guidance* (EPA 1992)
- *Guidance for Conducting Remedial Investigations and Feasibility Studies Under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)* (EPA 1988)
- *Test Methods for Evaluating Solid Waste* (EPA 1986), and subsequent updates and revisions.

In addition, a *Sampling and Analysis and Data Management Plan* (SADMP) was prepared and submitted as Appendix B to the *SI Work Plan*. The SADMP outlined the sampling and analysis activities, quality assurance (QA) policies, quality control (QC) procedures, intended data uses, documentation, and analytical methodologies necessary to implement the *SI Work Plan*. The plan outline and format complied with the policies and guidance specified in the following documents:

- U.S. EPA QA/R-5, *EPA Requirements for Quality Assurance Project Plans* (EPA 1999).

- U.S. EPA QA/G-5, *EPA Guidance for Quality Assurance Project Plans* (EPA 1998).

The objectives of the SI at the Arlington facility were to investigate the historic known and potential releases of site-related COPCs and to characterize the nature and extent of those releases. The approach presented in the EPA-approved *SI Work Plan* included investigating potential releases to: onsite surface and subsurface soil, onsite and offsite groundwater, onsite and offsite ditch sediment, and onsite and offsite air at the Arlington facility. In addition, the AOC allowed for incorporation of interim actions that may be identified as being appropriate for the Arlington facility. Such interim actions were taken and are described in this report. Additional investigation phases were proposed as addendums to the *SI Work Plan*. *Addendum A: Revised Air Quality Assessment* (Baxter 2003a) was initially prepared in response to Enclosure B of EPA's July 8, 2002, letter that disapproved the air quality assessment approach presented in the *SI Work Plan*, and Addendum A was subsequently revised to address comments provided by EPA in an August 28, 2002, meeting and in EPA's October 18, 2002, letter disapproving of the first draft of the addendum. *Addendum B: Supplemental Groundwater Investigation Work Plan* (Baxter 2003b) was prepared to provide a scope of work reflecting discussions with EPA in a February 27, 2003, meeting regarding the results of the SI activities to date. In addition, Baxter discussed the need for the installation and subsequent sampling of additional groundwater monitoring wells both onsite and offsite of the facility. The revised Addendum A and Addendum B received EPA approval and the scope of work proposed in each addendum was performed.

1.2 Document Overview

This SI report includes the following sections:

- ***Site Background*** (Section 2): This section describes the Arlington facility as well as historical and current operations. This section also summarizes known and potential releases of COPCs at the Arlington facility.
- ***Summary of Previous Investigations*** (Section 3): This section briefly discusses previous environmental investigations conducted at the Arlington facility. Results of the investigations are presented in Section 8.
- ***Improvement Measures*** (Section 4): This section describes certain improvement measures that have been completed at the facility
- ***Environmental Setting*** (Section 5): This section describes local and regional geology/hydrogeology, climate, physiography, surface hydrology and surrounding land and groundwater use.
- ***Investigation Approach*** (Section 6): This section presents the investigation approach and the technical basis for the investigation activities described in Section 7.
- ***Investigation Activities*** (Section 7): This section describes the soil, sediment, groundwater, air, and nonaqueous phase liquids investigation activities completed during the SI.

- ***Nature and Extent of COPCs*** (Section 8): This section describes the known distribution of COPCs in soil, sediment, and groundwater identified during previous investigations and the SI.
- ***Conceptual Site Model*** (Section 9): The conceptual site model incorporates elements such as facility background and history, contaminant sources and distribution, geology and hydrogeology.
- ***Summary of Findings*** (Section 10): This section summarizes the findings of the SI.
- ***References*** (Section 11): This section provides a list of references cited in this document.

In addition, the following appendices are included in this document:

- ***Data Tables*** (Appendix A): This appendix includes a compilation of all the available data from previous investigations and the SI through December 2004.
- ***Technical Memorandum - Ditch Improvements*** (Appendix B): This technical memorandum documents excavation activities and sampling results for the improvements to ditches at the facility.
- ***Borehole and Well Logs*** (Appendix C): This appendix includes boring logs for all soil borings and monitoring wells installed at the facility.
- ***Air Quality Assessment Report*** (Appendix D): This appendix includes a report presenting estimates of offsite air concentrations of COPCs that could potentially result from facility-related emissions based on modeling efforts.

- ***Quality Assurance Reviews*** (Appendix E): This appendix includes a compilation of all quality assurance memoranda completed during the course of the SI.

2 Site Background

This section provides background information on the Arlington facility, including its location, development and history, current wood treating operations, and hazardous waste management. The current Arlington facility features are shown in Figure 2-1. The locations of the former catch basins are shown in Figure 2-2. Other historical features are shown in Figure 2-3. Land development and history, as reported herein, were verified through a review of aerial photographs from years 1961 to 1995.

2.1 Facility Location

The Arlington facility is a wood preserving operation that occupies approximately 52 acres of land (Figure 2-1). Its primary business is the manufacture and preservation of telephone poles. The facility is located in southwest Arlington, Washington, at 6520 188th Street NE. The facility lies southeast of the intersection of 67th Avenue NE and 188th Street NE.

The property currently owned by Baxter consists of four parcels, as described below:

- Parcel A, which is approximately 17 acres in size and is the primary area where wood is treated and stored.
- Parcel B, which is approximately 28 acres in size and includes the area south of Parcel A where untreated poles are stored and peeled.
- A closed Wood Waste Landfill approximately 7 acres in size that was used for disposal of bark and wood shavings from pole peeling operations.
- A mixed-use area (zoned industrial) located in the northwest corner of the Arlington facility, approximately 5 acres in size.

For purposes of conducting the SI, the Arlington facility has been divided into three operational areas: Main Treatment Area (southern portion of Parcel A), Treated Pole Storage Area (northern portion of Parcel A), and Untreated Pole Storage Area (Parcel B) (Figure 2-1). The mixed-use area is not used for any current or historical operations, and is referred to in this document as the “northwest parcel”.

2.2 Facility Development and History

This section summarizes the historical ownership, development, and use of each of the four land parcels.

2.2.1 Parcel A (Main Treatment and Treated Pole Storage Areas)

Parcel A is bordered by the Burlington Northern Railroad on the east, 188th Street NE on the north, Parcel B on the south, and the closed Wood Waste Landfill and a mixed use property on the west. Prior to 1966, the northern half of Parcel A was used for farming.

In the mid- to late 1960s, Ted Butcher, Inc. (Butcher) developed the parcel as a wood-treating facility. Butcher peeled logs and treated them with a solution of pentachlorophenol (PCP) and/or creosote. A gravel pit on the parcel (Parcel A Gravel Pit) was backfilled with wood waste. Features present at the facility during the Butcher operations included a butt-treating tank (Old Butt Tank), a thermal retort (Old Thermal Retort), and a thermal tank (Old Thermal Tank) (Figure 2-2).

Baxter purchased Parcel A in 1970 and continued wood-treating operations. Shortly after the acquisition of Parcel A, Baxter purchased Parcel B (Figure 2-1) and moved untreated pole operations to this parcel. Wood-treating operations and storage of treated wood remained on Parcel A.

In 1970, the wood-treating facilities consisted of the Old Butt Tank, a tank farm adjacent to the Old Butt Tank, the Old Thermal Retort (Retort 1), and the Old Thermal Tank (Figure 2-3). Wood was treated with a PCP/medium aromatic oil solution. Typically, bags of PCP were dissolved in medium aromatic oil heated in the Old Butt Tank. This treating solution was pumped from the Old Butt Tank to above ground storage tanks (Tanks 1 to 3). Baxter completed several facility upgrades following purchase of the facility, including:

- Constructing a containment area for the tank farm (1974)
- Removing the Old Thermal Retort (1975)
- Cleaning and backfilling the Old Thermal Tank (1980)
- Installing a pressure Retort No. 2 and constructing a contained tank farm adjacent to the pressure retorts (1981)
- A drip pad was installed south of Retort 2 (1981)
- Installing a pressure Retort No. 3 (1984)
- Constructing a new contained butt treating tank (New Butt Tank) (1990)
- Constructing contained drip pads with a leak detection system north of the retorts (1991). At this time, use of the drip pads south of Retorts 2 and 3 was discontinued.
- Installed aprons adjacent to the drip pads (1995).

2.2.2 Parcel B (Untreated Pole Storage Area)

Parcel B lies on the southern border of Parcel A and the closed Wood Waste Landfill, and is bordered by the Burlington Northern Railroad on the east, an access road for U.S. Bayliner Corporation and National Foods Corporation on the south, and vacant land to the west. Before the early 1970s, Parcel B was farmland. Baxter purchased Parcel B shortly after purchasing Parcel A in 1970, and has always used the majority of Parcel B for untreated pole operations. A portion of the parcel is used to peel and store poles; the remaining portion is used for untreated pole storage (Figure 2-1).

2.2.3 Closed Wood Waste Landfill

The closed Wood Waste Landfill is located on the 7-acre plot of land bordering Parcel A on the west and Parcel B on the north (Figure 2-1). As late as 1965, this plot was undeveloped woodland. In 1967, the parcel was cleared for gravel mining operations. Baxter purchased this property in 1978 and used the gravel pit for landfill of shavings from peeling operations. In the early 1990s, the gravel pit/landfill was capped with soil and closed. A stormwater retention pond collects runoff from the landfill cap on the southwestern corner of the parcel. Groundwater monitoring is conducted in accordance with Snohomish County Health Department post-closure requirements.

2.2.4 Northwest Parcel

The Northwest Parcel is located in the northwest portion of the facility (Figure 2-1). Baxter purchased the parcel in 2003. The parcel is zoned industrial, and has two vacant residences on the parcel. Baxter is planning to modify the residences for future use as offices.

2.3 Current Wood Treating Operations

The Arlington facility imports raw logs and processes them into utility poles. Processing includes debarking, trimming, marking, seasoning, and treatment. The finished products are then shipped to utilities and other users by truck or rail. Current features at the Arlington facility are shown on Figure 2-1. Treatment processes and handling of treated poles are summarized below. All untreated charges are dry-kilned prior to final conditioning in the retorts.

2.3.1 Pressure Treating

Poles are placed under a vacuum in a pressure retort to remove moisture from the wood. Following drying, a heated treating solution (PCP and a carrier solution of medium aromatic oil) is applied to the retort under pressure. Following application of the pressurized treatment solution, the treated poles are dried in the retort by applying a vacuum. Water and oil removed during the drying process are transferred to an oil/water separator where the oil is recovered and recycled in the system. Activated carbon is used to treat PCP process water leaving the oil/water separator. The treated water is sent to the cooling tower for use in cooling condensers. Treated poles are removed from the retort and kept on Subpart W drip pads until all drippage has ceased.

2.3.2 Butt Treating

In the butt tank, poles are treated by partial immersion in an open vat containing a solution of 5.5 percent PCP in the carrier oil heated to approximately 212°F (maximum of 230°F). After immersion, the treated pole butts are suspended above the treatment tank until they stop dripping. A copper naphthenate (CuNap) process was added in 2003.

2.3.3 Treated Pole Storage

Pressure-treated and butt-treated poles are moved to the Treated Pole Storage Area (Figure 2-1) and placed on skids for storage, and ultimately shipped offsite by rail or truck.

2.4 Stormwater Management

Baxter historically managed stormwater by a system of ditches and catch basins/french drains that facilitate infiltration. The catch basins were largely installed in 1991, although

additional catch basins were added after 1991. In the spring of 2000, the catch basins in Parcel A were closed in accordance with Washington State Department of Ecology (Ecology) Administrative Order No. DECOWQNR-850 (Ecology 2000). In October 2002, the catch basins in the Untreated Pole Storage Area were closed. No catch basins remain at the facility, and stormwater at the Arlington facility is now treated by the recently constructed stormwater treatment system (SWTS).

2.4.1 Main Treatment Area Collection Ditches and Catch Basins/Drains

Baxter installed three catch basins (CBs) in the Main Treatment Area (CB13, CB14, CB23) in 1991 to collect and infiltrate stormwater (Figure 2-2). CB13 and CB14 were connected by an underground pipe that flowed to the east-west trending ditch. The east-west trending ditch flowed into a ditch along the northwest edge of the property (Figure 2-2). CB23 was located in this ditch. CB23 was connected to perforated pipes which were 12 inches in diameter, 20 to 40 feet long on both sides of the catch basin, and placed in drainage rock approximately 0 to 4 feet deep. In 1993 and 1994, two more catch basins (CB24 and CB25) were installed. As a result of surface topography and roads at the Arlington facility, all precipitation falling in the Main Treatment Area and Treated Pole Storage Area drained to facility ditches and catch basins in these areas. Precipitation falling in the Untreated Pole Storage Area drained to facility ditches and catch basins in the Untreated Pole Storage Area (Figure 2-2).

In May of 2000, Baxter closed CB13, CB14, CB23, CB24, and CB25 in Parcel A by removing the catch basins and capping the drain pipes in accordance with Washington State Department of Ecology Administrative Order No. DECOWQNR-850 (Ecology 2000).

On July 11, 2001, Baxter conducted supplemental closure activities at the locations of CB13 and CB14 at the request of Ecology. These supplemental closure activities

included excavating the area where the catch basins were formerly located down to the level of the capped drain pipes. A layer of low-permeability bentonite clay was placed between and around the capped drain pipes and within the footprint of the former concrete vault. The bentonite was then hydrated with water so that a minimum 4-inch sealing layer was installed. The soil stockpiled from the excavation was placed back on top of the bentonite to provide a working surface. The supplemental closure activities are described in an August 29, 2001, letter to Kirk Cook of Ecology from Hart Crowser (Hart Crowser 2001d).

In order to further isolate CB13 and CB14, Baxter installed a 60-mil high density polyethylene (HDPE) liner over the former basins in November 2002. The liner was covered with clean fill. These activities were described in the November 15, 2002, Progress Report submitted to EPA (Baxter 2002b).

2.4.2 Untreated Pole Storage Area Catch Basins/Drains

Baxter installed 19 catch basins in the Untreated Pole Storage Area in March 1991 to collect and infiltrate stormwater (Figure 2-2). Precipitation falling in the Untreated Pole Storage Area historically drained to facility ditches and catch basins in the Untreated Pole Storage Area. In October 2002, Baxter closed all 19 catch basins in the Untreated Pole Storage Area by removing the catch basins and capping the drainpipes. Soil samples were collected below each catch basin after removal, and selected soil samples were submitted for laboratory analyses. Closure activities are documented in a report submitted to Ecology and EPA in April 2003 (Baxter 2003c).

2.4.3 Stormwater Discharge Permits

Stormwater was managed at the Arlington facility under a National Pollution Discharge Elimination System (NPDES) Permit (WA-003142-9) between 1994 and April 2000.

Beginning in April 2000, stormwater has been managed under State Waste Discharge Permit (SWDP) ST-7425. The SWDP included periodic monitoring of select onsite wells, lysimeters, and drains. In 2002, the requirement for monitoring the drains was discontinued by Ecology. SWDP monitoring activities are documented in Discharge Monitoring Reports (DMRs) submitted quarterly to Ecology.

Following completion of the SWTS in early 2005, the SWDP was modified to monitor treated effluent from the SWTS instead of wells and lysimeters. The current SWDP (Ecology 2005) requires quarterly monitoring of treated effluent prior to discharge to an infiltration gallery. The effluent is monitored for the presence of PCP, polycyclic aromatic hydrocarbons (PAHs), dioxins and furans, total petroleum hydrocarbons (TPH), copper, and pH.

2.4.4 Stormwater Treatment System

All stormwater that falls at the facility is collected and treated in the recently constructed SWTS, located in the southeastern portion of the facility (Figure 2-1). Construction of the SWTS began in March 2004, and was completed on January 3, 2005.

Portions of the treated and untreated pole storage areas have been modified, and existing ditches extended and improved, to direct stormwater run-off to one of three collection sumps. A mixture of 12-inch, 15-inch, 18-inch, and 24-inch pipe was installed to convey the stormwater flows from the collection sumps to the SWTS. Accumulated stormwater in the collection sumps is conveyed to the wet well located at the SWTS. Pumps installed in the wet well transfer the stormwater into an untreated stormwater equalization tank at a rate sufficient to minimize ponding in the areas adjacent to the collection manholes.

Stormwater collected at the site is pumped into an equalization tank for storage prior to treatment. This storage tank has a capacity of approximately 660,000 gallons and is approximately 59 feet in diameter by 32 feet tall. In addition, a 125,000-gallon above-

ground storage tank has been installed for the purpose of storing treated water generated by the SWTS.

Raw stormwater is pumped from the equalization tank into a pH adjustment tank where caustic soda is used to raise the pH of the water to a minimum of 10.5. Water from the pH adjustment tank flows by gravity into the aluminum sulfate (alum) addition tank. Alum is added to this tank where it acts as a coagulant to agglomerate-charged colloidal particles and allows them to settle in a reasonable period of time.

Water leaving the alum addition tank flows by gravity into the flocculation tank where cationic polymer/coagulant is added to accelerate the formation of an insoluble floc. Water subsequently flows into the clarifier. The clarifier allows the floc to settle to the bottom and the clear water to discharge into a transfer tank. Centrifugal pumps transfer the water from the transfer tank through multimedia filters and activated carbon before discharging into the final pH adjustment tank. If necessary, sulfuric acid is added to this tank to ensure that the water will have a pH within the permitted discharge limits (6.5 to 8.5). The discharge pumps transfer treated water to the treated water storage tank, directly to the infiltration gallery, or back to the wet well.

The multimedia filters are designed to remove residual suspended solids not removed in the clarifier while the activated carbon will remove PCP and other trace organics. Periodically the multimedia filters and the carbon adsorption units are backwashed to remove accumulated solids. Backwash water is returned to the untreated stormwater storage tank for reprocessing through the treatment system. Solids generated in the clarifier are be pumped to the sludge thickening tank before being processed through the filter press. Decant water from the sludge thickening tank and filtrate from the filter press operation flows by gravity to the wet well where it is pumped back to the stormwater storage tank.

Treated stormwater is accumulated and then discharged from the storage tank or directly to the onsite infiltration gallery in accordance with the SWDP.

2.4.5 Surface Water Runoff

The Arlington facility is relatively flat and is surrounded by either berms or ditches. Ditches currently located at the Arlington facility do not lead offsite, and water collected in these ditches is treated by the SWTS; therefore, a low potential for offsite migration of surface water currently exists.

2.5 Hazardous Waste Management

PCP and creosote formulations, which are registered pesticides under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA), have been used for treating wood products at the facility. The PCP solution remains in use while use of creosote was discontinued in 1990. Beginning in 2003, Baxter began using copper naphthenate (CuNAP) for butt-treating poles.

Baxter recycles and reuses process residuals and wastewater in accordance with RCRA. In addition, under Baxter's *Incidental and Infrequent Drillage Plan*, soil is inspected daily and any liquid or stained soil is collected and disposed of as hazardous waste. Hazardous wastes generated at the Arlington facility are managed in accordance with federal, state and local regulations. Baxter is a large quantity generator, and wastes are properly disposed of within the 90-day time frame.

2.5.1 Reported Spills

Overflows from the Old Butt Tank were reported in March 1981 (1,400 gallons), February 1989 (200 gallons), and January 1990 (2,000 gallons) (WCC 1990). Workers

reportedly recovered most of the spillage in each case. The general locations of these releases are shown on Figure 2-3.

In addition to the butt treating tank overflows, PCP treating solution and creosote were observed in the septic tank around 1975 when the Old Thermal Retort was removed (Crane, pers. comm. 2001).

During Butcher operations in the mid- to late 1960s, PCP and creosote wastes were reportedly disposed of in a 20-foot by 20-foot pit (EPA 1984, referred to as the "Butcher Pit"). The location of the pit is unknown. However, during expansion of the treatment system in the 1980s, Baxter excavated approximately 40 tons of a hard, heavy tar-like substance in the area just west of the kilns (Figure 2-3). The material was transported and landfilled at Chemical Waste Management's Arlington, Oregon landfill (Crane, pers. comm. 2001). No information is available on the composition of the tar-like substance.

Documentation of reported spills, recovery efforts, and individuals having knowledge of these spills and recovery efforts were provided to EPA in a letter dated February 20, 2001 (Watson 2001).

3 Summary of Previous Investigations

Several environmental investigations have been performed at the Arlington facility since 1989. A brief description of the previously completed investigations is provided below. The results of each of these investigations are provided in Section 8 (Nature and Extent of COPCs). A map showing all sampling locations or features referenced in this section is provided on Figure 3-1.

3.1 Closed Wood Waste Landfill Investigations

Baxter conducted a hydrogeologic investigation of the Wood Waste Landfill in July 1988 as part of closing the landfill under Chapter 173-304 Washington Administrative Code (WAC). The investigation included installation of four wells, bail tests, groundwater monitoring, and a beneficial use survey and water balance for facility groundwater. Additional details are provided in the *Hydrogeologic Report* (EMCON 1989).

Baxter has monitored the four wells near the closed Wood Waste Landfill (BXS-1, BXS-2, BXS-3, and BXS-4) (Figure 3-1) on a quarterly basis since July 1988. Results are summarized in annual reports submitted to the Snohomish County Health Department and Ecology. Groundwater data from these sampling events are presented in Appendix A.

3.2 Soil and Groundwater Investigation (1990)

Baxter conducted a soil and groundwater investigation in 1990 in response to the January 1990 Old Butt Tank overflow (WCC 1990). Activities included installation of one soil

boring (B-1) in the spill accumulation area and three monitoring wells (MW-1, MW-2, and MW-3). Soil samples were collected from the borings and analyzed for PCP and pyrene. Groundwater samples were collected from the three new wells and four existing wells and analyzed for semivolatile organic hydrocarbons (SVOCs), including PCP and PAHs. Additional details of the investigation are provided in the *Soil and Groundwater Investigation Report* (WCC 1990).

In August and October 1991, Baxter collected groundwater data at the Arlington facility as a follow-up to the 1990 soil and groundwater investigation (WCC 1991). The parameters of groundwater elevation, specific conductivity, pH, temperature, and PCP concentrations were measured at wells MW-1, MW-2, MW-3, BXS-1, BXS-2, BXS-3, and BXS-4 during these two sampling events (Figure 3-1).

3.3 Site Hazard Assessment

Ecology collected surface soil samples at four locations in Parcel A for analysis of PAHs and PCP as part of a site hazard assessment (Ecology 1992).

3.4 NPDES and State Waste Discharge Permit Monitoring

Baxter has been collecting groundwater and stormwater quality data since 1994 as part of the monitoring requirements associated with the NPDES Permit and SWDP No. ST-7425.

3.4.1 Groundwater Monitoring

Initial groundwater monitoring consisted of four wells (MW-1, MW-2, MW-3, and MW-4), as part of the NPDES Permit. With the issuance of the initial SWDP in April 2000, groundwater samples were collected from monitoring wells BXS-1, MW-2, HCMW-5,

HCMW-6, and HCMW-7 every three months and analyzed for general chemistry parameters and PCP. Groundwater samples were also collected twice a year from wells BXS-2, BXS-3, BXS-4, MW-1, and MW-3. Beginning in April 2003, two additional wells (MW-10, MW-15), completed as part of the SI, were added to the SWDP monitoring schedule.

Following completion of the SWTS and issuance of a new SWDP in January 2005, groundwater monitoring is no longer required as part of the SWDP.

3.4.2 Stormwater Monitoring

In addition to groundwater monitoring, Baxter collected stormwater samples at former catch basins in the Main Treatment Area, the Treated Pole Storage Area, and the Untreated Pole Storage Area between September 1994 and April 2000 as part of the NPDES permit. Stormwater monitoring included estimating the flow rate to the catch basins and collecting water samples every 2 to 3 months during significant storm events between September and May. Water samples were analyzed for pH, oil and grease, total suspended solids (TSS), PAHs, and PCP.

With the issuance of the SWDP in April 2000, stormwater samples were collected from catch basins in the Untreated Pole Storage Area and analyzed for oil and grease, suspended solids, PCP, and polychlorinated dibenzo-*p*-dioxins and polychlorinated dibenzofurans (PCDD/PCDFs). Monitoring of stormwater samples in the Untreated Pole Storage Area was discontinued when the catch basins were removed in 2002.

3.4.3 Lysimeter Monitoring

Beginning in January 2001, lysimeters (L-1, L-2, and L-3) were monitored in the Treated Pole Storage Area every two months between September and May. Lysimeter samples are analyzed for PCP, TPH, and PCDD/PCDFs from 2001 to early 2005. Following

completion of the SWTS and issuance of a new SWDP in January 2005, lysimeter monitoring is no longer required as part of the SWDP.

3.4.4 PCDD/PCDF Study

In 1997 and 1998, Baxter conducted a PCDD/PCDF study of the stormwater as a requirement of the 1994 NPDES permit (Baxter 1998). The study included collection and analysis of samples in September 1997 and January 1998 from several catch basins.

These samples and two samples of PCP treating solution were analyzed for chlorophenols, PAHs, and PCDD/PCDFs. In June of 1998, additional stormwater samples were collected for PCDD/PCDF analysis. Both filtered and unfiltered samples were collected from two of the catch basins to assess how suspended solids affect PCDD/PCDF concentrations.

3.5 Drinking Water Well Sampling Program

Beginning in June 2001, Baxter conducted semiannual monitoring of drinking water in 21 offsite drinking water wells. The purpose of the drinking water sampling was to determine if historical operations at the Arlington facility had affected drinking water in neighboring wells. The sampling activities were conducted in accordance with the AOC and the *Drinking Water Sampling and Alternate Water Supply Work Plan* developed under the AOC and submitted to EPA (Hart Crowser 2001c).

In order to identify wells in the area, a drinking water well survey of the area around the Arlington facility was conducted by reviewing state water well databases, City water service records, and completing a door-to-door survey of residents in the surrounding area.

All functioning drinking water wells identified in the survey were sampled by Hart Crowser on behalf of Baxter. The water samples were collected from the nearest outside spigot or faucet in accordance with standard EPA sampling protocols. Drinking water well samples were collected biannually during four sampling events, which occurred in June 2001, January 2002, July 2002, and January 2003. Following sample collection, the water samples were submitted to Columbia Analytical Services of Kelso, Washington, a qualified analytical laboratory, for analysis of PCP and tetrachlorophenols (TeCP) by EPA Method 8151M.

No PCP or TeCP were detected in any of the wells during the two-year period. In addition, EPA collected split samples in January 2002, which confirmed Baxter's sampling results. Based on these results, EPA determined that drinking water well sampling could be discontinued. The Drinking Water Well Sampling Report was submitted to EPA as Attachment 1 of the April 15, 2005, Progress Report (Baxter 2004a).

3.6 AKART Study

In 1997, Baxter conducted an AKART (all known and reasonable methods of prevention, control, and treatment) analysis to comply with an Ecology Order on Consent that required evaluating treatment technologies and best management practices to meet groundwater quality standards that became effective in 1996. The AKART study identified potential sources of PCP at the Arlington facility and evaluated possible methods of source control (AGI 1997).

3.7 PCP Occupational Exposure Study (1999)

The Pentachlorophenol Task Force conducted an *Inhalation Dosimetry and Biomonitoring of Worker Exposure to Pentachlorophenol During Pressure Treatment of Lumber Study* at five wood treating plants in the United States and Canada, including the

Arlington facility (Bookbinder 1999). The study was conducted pursuant to an EPA Data Call-In related to EPA's re-registration of PCP as a restricted-use pesticide.

Several workers at the Arlington facility were monitored for PCP exposure as part of this study. The workers were selected to represent the typical job functions at a wood treating facility. PCP exposure was measured using standard methods as mandated by the National Institute for Occupational Safety and Health (NIOSH). Workers wore a battery-powered sampling pump with a PCP sorbent tube during the course of their normal workdays.

PCP was detected in the sorbent tube of only a single Arlington facility worker (the treatment assistant), and the maximum daily exposure for that worker was only 3 percent of the Occupational Safety and Health Administration (OSHA) limits. These data indicate that all workers were exposed to airborne concentrations well below the OSHA standards¹.

3.8 Remedial Investigation (1999-2001)

In 1999, 2000, and 2001, Baxter conducted a field investigation to identify potential sources of PCP detected in groundwater at MW-2, MW-3, and BXS-1 (Figure 3-1). The field investigation included installation of 36 soil boreholes, three wells, collection of

¹ OSHA's occupational limits of exposure for PCP in air differ from Region 9 preliminary remediation goals (PRGs) for ambient air that were developed based on residential exposure assumptions. Generally, the OSHA occupational exposure limits are higher than the Region 9 residential or non-residential PRGs. The OSHA occupational exposure limit for PCP is presented and compared with the measured data as a means to demonstrate that the facility is in compliance with relevant OSHA standards.

shallow soil samples, and a field survey of potential water supply wells near the Arlington facility (Hart Crowser 2000, 2001c). These data are discussed in Section 8.

4 Improvement Measures

This section describes improvement measures that have been conducted at the facility since 2002. The improvement measures are not specifically related to the SI, and as such, are not “interim actions.” However, the improvements reduce the potential for releases of site-related chemicals to the environment. A brief description of the major improvements completed over the last few years is provided below.

4.1 Apron Modifications

In November 2002, Baxter completed modifications to the aprons. The modifications included placement, grading, and compaction of a crushed aggregate base material over the existing apron and footprint of the new apron. Asphalt was then placed and compacted over the crushed aggregate to form a final wearing surface. A berm was installed along the outer edges of the new aprons to prevent stormwater from flowing off the aprons, and effectively directed water flow to the collection sump for treatment in the process water treatment system. Elevations of the final asphalt surface were carefully surveyed to ensure that stormwater would flow to the collection sump at the southern end of the apron.

During the apron modifications, a new 4-inch diameter polyvinyl chloride (PVC) pipe was installed from the collection sump adjacent to the aprons to a new rectangular tank placed in the treatment building. The 4-inch PVC pipe was “double contained” in a 6-inch steel pipe. A submersible pump was installed to transfer water from the collection sump to the existing process water treatment system. Three existing tanks previously

located on the west side of the treating building were moved to east side for storage of treated water, and placed on concrete foundations within secondary containment berms.

4.2 Tram Storage Area

In 2002, Baxter constructed a covered area adjacent to the Main Treating Building to store trams. Poles are placed on the trams and then are transported to the retort for treatment. Stormwater that collects in the tram storage area is collected and treated in the process water treatment system. Construction of the tram storage area minimizes the potential for stormwater to contact residual treating chemicals potentially present on the trams.

4.3 Ditch Improvements

Between September 30 and October 6, 2004, Baxter performed improvement measures in Ditch 1 and Ditch 2 (Figure 1-2). The purpose of the improvement measures was to remove material with low levels of site-related chemicals from the ditches. These improvement measures were conducted under the provisions of Paragraph 63 of the AOC regarding other work at the facility. The proposed scope of work for the improvement measures was outlined in a letter to EPA dated August 10, 2004 (Baxter 2004b), and approved by EPA in a letter dated August 17, 2004 (EPA 2004).

Material within Ditches 1 and 2 included eroded soil and rock ditch base material and is collectively identified as ditch material. Baxter had previously sampled the material in the ditches as part of the Site Investigation in 2002. Sampling results indicated that PCP concentrations slightly exceeded EPA Region IX's Preliminary Remediation Goal (PRG) of 9 mg/kg for direct contact with soil.

Excavation and sampling of the two ditches were managed in different ways, based on the known concentrations and operational history of the ditch material. Material from Ditch 1 was excavated in a single phase and placed directly into a dump truck and transferred to a plastic-lined, onsite soil pile. Material from Ditch 2 was excavated in two separate phases. As directed by EPA, Ditch 2 material was placed directly into steel roll-off bins designed for temporary storage of hazardous waste.

Following completion of excavation activities in Ditch 1, all soil was transferred to a bermed and lined soil pile located onsite. The top of the soil pile was covered with plastic and secured. Approximately 100 cubic yards of material was removed from Ditch 1. Sampling results following excavation activities indicated that all remaining soil was below the PRGs for PCP.

During the initial phase of the excavation in Ditch 2 (Phase 1), approximately 6 inches of material was removed from the entire length of the ditch (approximately 450 linear feet), including the sides and base of the ditch. Where a geotextile fabric was present in the ditch (i.e., the southern half of Ditch 2), the excavation extended an additional 6 inches below the fabric. Following receipt of preliminary results from the Phase 1 excavation in Ditch 2, which indicated PCP concentrations slightly above the PRG remained in the ditch, additional material was excavated from the southern half of the ditch (Phase 2). An additional 1 foot to 2.5 feet of gravelly material with few fines was removed from the southern half of Ditch 2.

Confirmation samples collected following completion of all excavation activities in Ditch 2 indicated that PCP concentrations of material remaining in place were below the PRGs, and that PCP concentration decreased with depth. A total of 256 tons of material from Ditch 2 was transported to Waste Management Inc.'s Subtitle C disposal facility in Arlington, Oregon and landfilled.

Additional details of the excavation and sampling activities is provided in Appendix B:
Technical Memorandum – Ditch Improvements.

4.4 Stormwater Treatment System

As stated previously, Baxter completed construction of a SWTS at the facility in early 2005. A full description of the SWTS is provided in Section 2. A stormwater treatment facility is required as part of the SWDP.

Extensive planning, investigations, and design activities were conducted between 2000 and early 2004, prior to initiating construction activities for the SWTS in March 2004. A partial list of activities and milestones associated with implementing the stormwater improvement measures is provided in the following list:

- March 2000: The Excess Stormwater Management Work Plan was prepared and submitted to EPA (Hart Crowser 2001b).
- May 2002: Completed the Hydrologic Analysis Report for stormwater at the Arlington facility (Hart Crowser 2002).
- September 2002: The Engineering Design Report and State Environmental Policy Act (SEPA) Checklist was submitted to Ecology (ERI 2002).
- Summer 2002 – Winter 2003: Baxter conducted pilot testing and treatability testing for onsite stormwater.
- October 2002: Baxter requested authorization from Ecology to conduct a phased approach for stormwater management. This phased approach included treatment of excess stormwater by a pilot treatment system during the interim period prior to completion of the SWTS (Baxter 2002c).
- October 2002: Baxter obtained approval from Ecology for the proposed phased approach for stormwater management (Ecology 2002).

- October 2002: A Hydrologic Assessment Report evaluating discharge to downstream drainage courses was submitted to Ecology (Shapiro 2002).
- November 2002: Baxter obtained approval from EPA on the proposed phased approach for stormwater management (EPA 2002b).
- April 2003: An Engineering Report Amendment was submitted to Ecology (Baxter 2003d). The amendment documented a change in the proposed location of the SWTS, and the modification that treated effluent would be discharged to an onsite infiltration gallery.
-
- June 2003: Baxter received authorization from Ecology to discharge treated effluent to the infiltration gallery (Ecology 2003a).
- August 2003: Submitted the Plans and Specifications for Stormwater Improvement Measures to Ecology (Baxter 2003f).
- September 2003: Plans and Specifications for the Stormwater Improvement Measures were approved by Ecology (Ecology 2003b).
- March 1, 2004: Baxter received final authorization from the City of Arlington for construction of the SWTS (City of Arlington 2004).
- March 2004: Construction of the SWTS was initiated.
- January 3, 2005: Baxter completed construction of the SWTS and submitted the "Declaration of Construction of Stormwater Pollution Control Facilities" to Ecology, along with a Treatment System Operating Plan (Baxter 2005).

Effluent samples collected in January and February 2005 indicate that the SWTS is operating as designed, and meets the final effluent limitations as specified in SWDP No. ST-7425.

5 Environmental Setting

This section describes the environmental setting including geology, hydrogeology, and other environmental conditions relevant to the SI.

5.1 Regional Geology

The Arlington facility lies in the Marysville Trough, a broad outwash plain located generally between Arlington and Marysville, Washington. The trough was originally carved out by river and/or glacial erosion and then subsequently filled in with a thick sequence of recessional outwash (coarse-grained glacial deposits). The recessional outwash deposits are estimated to be at least 100 feet thick in the area of the facility (Minard 1985, Newcomb 1952). Figure 5-1 presents a regional geologic map and cross section across the Arlington facility.

The Getchell Hill upland lies to the east of the facility. This glaciated upland sequence includes a till cap underlain by a thick sequence of advance outwash (fine-grained glacial deposits). The advance outwash deposits have mapped a thickness of up to 250 feet (Minard 1985); however, most of these deposits were scoured and replaced by the recessional outwash of the Marysville Trough. The advance outwash deposits are underlain by fine sand, silt, and clay of the Transitional Beds Unit (Minard 1985).

5.2 Regional Hydrogeology

Regional groundwater flow directions in the outwash deposits are to the north and northwest, with a groundwater divide estimated to be about one mile south of the

Arlington facility (Figure 5-2) (USGS 1997). The closest surface water receptor is Portage Creek, a tributary to the Stillaguamish River. Portage Creek lies approximately 5,000 feet north and northwest of the facility and is likely the principal discharge point for groundwater in the outwash deposits (Newcomb 1952).

5.3 Local Hydrostratigraphic Units

Lithologic data collected from the facility have been used to define three distinct hydrogeologic units at the Arlington facility. These units are referred to herein as Fill Material, Gravelly Sand, and the deeper Fine Sand, discussed in the following sections. Generalized geologic cross sections across the facility are presented in Figures 5-3 through 5-6. Lithologic logs for borings and wells installed at the facility are presented in Appendix C.

- **Fill Material.** Several fill materials are present at the Arlington facility, including wood waste and backfill material. Typical depths of fill range from 0 to 4 feet below ground surface (bgs); however, fill has been observed at depths up to 13 feet bgs in the Main Treatment Area and is reportedly present at depths up to about 23 feet bgs in the closed Wood Waste Landfill. These fills are typically distinguished from native material based on the presence of wood chips, organic material, charcoal, and higher silt content.
- **Gravelly Sand.** The Gravelly Sand unit is the uppermost native material at the Arlington facility and is present below the Fill Material. This unit typically occurs from 0 to 4 feet bgs depending on fill thickness, to a depth 15 to 25 feet bgs; however, Gravelly Sand has been observed as deep as 42 feet bgs (Figure 5-3). The Gravelly Sand unit is typically gray to brown gravelly sand with little silt.

- **Fine Sand.** The Fine Sand unit is present beneath the Gravelly Sand at depths below 15 to 42 feet bgs, depending on the location at the facility. The Fine Sand typically consists fine to medium sand with small amounts of silt.

5.4 Local Hydrogeology

Groundwater is present beneath the facility at depths between 10 and 40 feet bgs depending on time of year and location on the facility. Groundwater elevations are highest on the south and east sides of the facility. Seasonal water level fluctuations average approximately 4 to 5 feet; however, fluctuations of 10 to 20 feet have been observed in response to long-term precipitation cycles. Figures 5-3, 5-4, 5-5, and 5-6 show the range in water table elevation in cross section between the wettest and driest periods recorded for the area over the last several years.

Seasonal precipitation and groundwater elevations for selected wells for the period 1994 to 2000 are shown in Figure 5-7. These data indicate that higher water levels are closely related to the amount of precipitation at the facility. Groundwater data was collected irregularly between 1988 and 1994 and is therefore not included in this figure.

Inferred groundwater flow patterns for April 2004 and October 2004 are illustrated on Figures 5-8 and 5-9, respectively. These potentiometric surface maps include wells installed during the SI. Groundwater generally flows to the northwest. Hydraulic gradients vary across the facility, potentially indicating differences in aquifer permeability across the facility.

Bail test data from facility wells and grain size analysis from subsurface soil samples (Hazen's test) were used to estimate hydraulic conductivity. Hydraulic conductivity values range from 2 to 20 feet/day in the Fine Sand, and 100 to 150 feet/day in the

Gravelly Sand. A tabular summary of hydraulic conductivity data is provided in Table 5-1.

Based on the hydraulic conductivity data, observed gradients from October 1999, and an assumed porosity of 0.3, groundwater flow velocities are estimated between 0.2 and 2 feet/day in the Fine Sand (Main Treatment Area), and 0.4 to 5 feet/day in the Gravelly Sand (northwest portion of the facility).

5.5 Climate

Precipitation data from the weather station at the Arlington Airport (located one-quarter mile west) for the period from 1948 to 2000 indicates average annual rainfall of 46.4 inches (WRCC 2001). Average monthly rainfall totals for this time period are presented on Figure 5-10. Wind frequency data is presented in Figure 5-11.

Meteorological data for the Arlington Airport is discussed in detail in the *SI Work Plan*. Meteorological data for the Arlington Airport and surrounding air stations is discussed in detail in Appendix D of this report.

5.6 Surface Water

The Arlington facility is situated within the Marysville Trough glacial outwash plain. The outwash plain is comprised of sands and gravels that drain readily, leaving few natural surface water drainage features. Because of the internal drainage, the majority of the precipitation in the area infiltrates and becomes part of the groundwater system. The groundwater in the area flows largely to the north-northwest to the Portage Creek Valley (USGS 1997) (Figure 5-2).

The facility also lies on the northernmost boundary of the Quilceda Creek watershed. In this area, surface water flow from the Getchell Upland to the east is directed to a

man-made ditch that flows south along the Burlington Northern Sante Fe (BNSF) railroad tracks (Figure 2-1). A network of drainage ditches convey these surface waters to Quilceda Creek approximately two miles south of the Arlington facility.

5.7 Surrounding Land Use

The facility lies in an area zoned Industrial by the City of Arlington. Land to the north, south, east, and west is also zoned Industrial. The closest property zoned Residential is 300 feet to the east (hydraulically upgradient) of the facility and separated from the facility by other industrial land use and 67th Avenue NE (Figure 1-1). There are non-conforming-use residences on properties adjacent to the facility on the northwest and southeast sides. To the northwest, approximately 400 feet from the facility boundary, exists a mobile home park. A residence exists southeast of the facility and the Untreated Pole Storage Area borders the land on which the residence is situated on three of its four sides (Figure 1-1). Historical land use and facility development was discussed previously in Section 2.2.

5.8 Groundwater Use

The Marysville Trough comprises a large unconfined aquifer that extends from Arlington to Marysville (Figure 5-2). The aquifer is estimated to extend to a depth of 100 to 150 feet bgs. Because of the productive nature of the aquifer, there is considerable use of this resource for domestic and industrial water supply.

In 1988, Baxter conducted a beneficial use survey of water supply wells in the area (EMCON 1989). This survey was updated in 2000 by Baxter (Hart Crowser 2000) and in 2001 (Hart Crowser 2001a). Within the survey area, 26 water wells were identified. Of these, 21 are being used for water supply (i.e., domestic, irrigation, or industrial). The other five wells identified have been abandoned (Hart Crowser 2001a). A City of

Arlington water supply well is located approximately 1,500 feet to the west of the facility.

6 Investigation Approach

6.1 General Approach

The investigation approach was discussed in detail in the *SI Work Plan* and is discussed more generally below.

Information regarding the suspected distribution of site-related COPCs at the facility was ascertained through a review of historical facility operations, discussions with facility personnel, regulatory records, and results of previous investigations. This information was used to develop the general site investigation approach used during the SI. The objectives of the SI were to define the nature and extent of release(s) of site-related COPCs at the Arlington facility. The investigation approach incorporated contingencies such that data was first gathered and evaluated to provide the logic and rationale for the continued course of the investigation. The purpose of the SI was to identify releases of contaminants to the environment and to determine the nature and extent of those releases to provide sufficient information to design appropriate corrective measures. Work scopes for additional phases of the SI were prepared as addenda to the *SI Work Plan*, submitted to EPA for review pursuant to Section XII of the AOC, which subsequently received EPA approval and were performed.

6.2 Consolidation of Areas of Investigation

Another element of the SI involved consolidating specific portions of the facility into investigation areas. Consolidation is based on the historic and current site usage. As

illustrated in Figure 6-1, the Main Treatment Area (including the Penta Storage Building), Untreated Pole Storage Area, and Treated Pole Storage Area were each designated Areas of Investigation (AOIs). While individual known and potential sources received focus during the SI, a comprehensive approach for investigating each area was undertaken.

6.3 *Subsurface Soil Investigation*

Site-related COPCs were detected in surface and subsurface soil in both the Main Treatment Area and Treated Pole Storage Area during previous investigations at the Arlington facility. Investigations to further define the nature and extent of these COPCs were performed through the installation of soil borings. Some of the borings were converted to groundwater monitoring wells in accordance with the *SI Work Plan*. For purposes of lithologic logging, all soil borings were sampled continuously. Field screening was performed at 5-foot intervals. Field screening of soil samples collected from the vadose and saturated zones included use of a photoionization detector (PID), sheen tests, visual observations and odor. Field screening results and other field observations were used in the selection of samples for chemical analysis and depth of boreholes using the criteria established in Section 8 of the *SI Work Plan*. The majority of the borings were located primarily in the Main Treatment Area and Treated Pole Storage Area. Several of the borings were located in the Untreated Pole Storage Area—seven located adjacent to the catch basins to evaluate the effects of stormwater infiltration on subsurface soils and groundwater, one located on the southern property boundary for purposes of installing a well to collect data regarding groundwater elevation and quality in this portion of the Arlington facility, and two on the southern property boundary to assess potential historical offsite migration of affected surface water.

6.4 Surface Soil Investigation

Surface soil samples were collected from the Treated Pole Storage Area and the Untreated Pole Storage Area. Samples were collected at 25 locations in these two areas. Soil sample locations were selected on a random basis, with the exception of two sample stations. One of the non-random stations is located near the entrance to the Penta Storage Building, and the other station is located near the aprons as requested by EPA. At every sample location, soil samples were collected from the 0- to 2-inch depth interval and from a composite of the 6- to 18-inch depth interval. Samples collected from the deeper interval represented a vertical composite across this interval. Field screening of surface soil samples included the use of a PID, sheen tests, visual observations, and odor. Field screening results and other field observations were used in the selection of samples for chemical analysis using the criteria established in the *SI Work Plan*.

6.5 Sediment Investigation

Five sediment samples were collected onsite from the ditch west and north of the Treated Pole Storage Area. These samples were collected in order to assess the extent of COPCs in the ditches. Field screening of sediment samples included the use of a PID, sheen tests, visual observations, and odor.

6.6 NAPL Investigation

Creosote and PCP formulations are potential sources of non-aqueous phase liquids (NAPL) as light NAPL (LNAPL) or dense NAPL (DNAPL) in subsurface soils.

Investigations related to the nature and extent of NAPL included the attempted collection of NAPL samples from two new wells in the Main Treatment Area for characterization, continuous sampling and logging of soil borings, and field screening of soil samples to

assess potential NAPL pathways and/or accumulation of NAPL. Some of these activities were conducted as part of the soil and groundwater investigations. Field screening of soil samples from the vadose and saturated zones included the use of a PID, sheen tests, visual observations, and odor. Field screening results and other field observations were used in the selection of samples for chemical analysis and depth of boreholes using the criteria established in the *SI Work Plan*.

6.7 Groundwater Investigation

Historical data from existing groundwater monitoring wells at the Arlington facility indicated a distinct dissolved-phase PCP plume is present downgradient of the Main Treatment Area. This plume was delineated through the installation of groundwater monitoring wells both onsite and offsite of the Arlington facility. The wells were located in the hydraulically downgradient direction of the Main Treatment Area. Well placement was determined using direct push technology (DPT) methods for collecting screening-level grab groundwater samples, in accordance with the criteria established in the *SI Work Plan*. The screening-level grab groundwater samples are qualitative due to turbidity, and were only used to assess the general geometry of the plume. Following preliminary delineation of the plume, additional well locations were proposed in an addendum (*Addendum B: Supplemental Groundwater Investigation Work Plan*) to the *SI Work Plan* and submitted to EPA for approval pursuant to Section XII of the AOC.

In order to evaluate the possible effects of stormwater infiltration from the Untreated Pole Storage Area on groundwater quality, seven screening-level grab groundwater samples were collected from DPT borings in the vicinity of the catch basins.

Following the installation of the wells installed during the SI, all offsite and onsite facility wells were sampled at least twice prior to completing and submitting this SI report.

6.8 Air Investigation

Air emissions from the Arlington facility include process emissions and non-process emissions (e.g., fugitive dust). Process emissions consist of those emissions from the retorts and butt tank, storage and handling of wood treating solutions, recycling of wood treating chemicals, treated water recycling and cooling tower operation, and fugitive emissions from process piping. Non-process emissions include fugitive dust generated as the result of wind entrainment of surface soil affected by COPCs, or from vehicular traffic over affected soil. COPC emissions from the Arlington facility were modeled to estimate the downwind concentrations at the facility boundary and beyond. Modeled concentrations of COPCs summarized in this report are based on emissions from the Baxter facility that occurred during 2001. No substantial changes in the treatment system or volumes of treated wood have occurred since 2001.

The Air Quality Assessment was conducted in accordance with the *SI Work Plan* for the Arlington facility, and the subsequent *Addendum A: Revised Air Quality Assessment to the SI Work Plan*. The results of the report estimate the offsite air concentrations that could potentially result from facility-related emissions. The results of the assessment are summarized in Section 8. The complete *Air Quality Assessment Report* is presented as Appendix D of this report.

6.9 Facility Survey

Sample station locations were measured for horizontal control by a Washington State licensed surveyor. Following the completion of the field activities, vertical elevation were surveyed to the nearest 0.01 foot at the top of all new monitoring well casings. Measurements were taken at the "notched" or "marked" spot on the top edge of the well casing.

Coordinate locations were established from a local benchmark with elevations referenced to North America Vertical Datum 1983 (NAVD83) and horizontal control referenced to the Washington Coordinate System.

7 Investigation Activities

This section of the report provides a description of the field investigations conducted at the Arlington facility in association with the SI.

Detailed field procedures for the SI activities were included in the SADMP (Appendix B of the *SI Work Plan*). Data quality assurance procedures were also provided in the SADMP and define the laboratory procedures and QA/QC requirements and data quality objectives for analytical sampling and analysis.

7.1 Main Treatment Area Investigations

Soil, sediment, NAPL and groundwater investigations performed to address the nature and extent of COPCs in the Main Treatment Area are presented in this section. Soil and groundwater sample stations within the Main Treatment Area are shown on Figures 7-1, 7-2, and 7-3. Monitoring well completion details are shown on the boring logs provided in Appendix C.

7.1.1 Soil Investigation

7.1.1.1 Task 1.1.1 - Surface Soil Investigation

One surface soil sample (SS24) was collected from the Main Treatment Area from just west of the pressure retorts. Two soil samples were collected at this sample station. One sample was collected from 0 to 2 inches, and one was collected from a vertical composite of the 6- to 18-inch interval. Both soil samples collected from this sample station were

collected using hand tools and field screened using sheen tests, visual observations, odor, and a PID. The 0- to 2-inch interval was analyzed for chlorinated phenols, TPH as diesel range petroleum hydrocarbons (TPH-D), and PCDD/PCDF. The 6- to 18-inch interval was analyzed for chlorinated phenols, TPH-D, and PAHs.

7.1.1.2 Task 1.1.2 – Subsurface Soil Investigation

Soil boring locations are shown on Figures 7-2. Boring logs are provided as Appendix C.

NAPL Area

Nine borings (SB-35 through SB-40, and SB-61 through SB-63) were installed in the areas where NAPL occurrence in subsurface soil was previously observed (Figure 7-2). These borings were installed for the purpose of laterally delineating NAPL in vadose zone soils and LNAPL at the soil-groundwater interface. The borings were installed to depths ranging between approximately 34 and 39 feet bgs. The borings were installed using DPT methods and soil samples were collected continuously for lithologic logging purposes. Select soil samples collected from borings SB-35 through SB-40 and SB-61 through SB-63 were submitted for chemical analyses for chlorinated phenols, TPH-D, and PAHs. Soil sample intervals retained for chemical analyses were selected based on the selection criteria described in the *SI Work Plan*.

Retort Area

Two borings (SB-41 and SB-42) were installed to investigate the possible presence of COPCs south and west of the retorts (Figure 7-2). Borings SB-41 and SB-42 were installed to depths of approximately 42 and 43 feet bgs, respectively. The borings were installed using DPT equipment and samples were collected continuously for lithologic logging purposes. Four soil samples collected from each boring were submitted for chemical analyses for chlorinated phenols, TPH-D, and PAHs. Soil sample intervals retained for chemical analyses were selected based on the selection criteria described in the *SI Work Plan*.

MW-10/MW-11 Boreholes

The boring for monitoring well MW-10 was installed west of the retorts for the purpose of installing a groundwater monitoring well to evaluate groundwater quality downgradient of the paved former drip area used between 1981 and 1991 (Figure 2-3; Section 2.2). The boring for monitoring well MW-11 was installed east of the Main Treatment Area for purposes of installing a groundwater monitoring well near the eastern facility boundary to gather groundwater elevation and flow data, and to evaluate groundwater quality in this portion of the facility (Figure 7-3). The boring for well MW-10 was installed using hollow stem auger (HSA) drilling equipment to a depth of approximately 43 feet bgs. The boring for well MW-11 was installed using HSA drilling equipment to a depth of approximately 38 feet bgs.

During the installation of well borings MW-10 and MW-11, soil samples were collected continuously for lithologic logging purposes. Soil samples were field screened at 5-foot intervals. Three samples collected from each of these two well borings were submitted for chemical analyses for chlorinated phenols, PAHs, and TPH-D. Soil sample intervals retained for chemical analyses were selected based on the selection criteria described in the *SI Work Plan*.

MW-12/MW-13 Boreholes

The borings for wells MW-12 and MW-13 were installed near former borings SB-30 and BT-W, respectively, in which NAPL was previously observed (Figures 7-2 and 7-3). These borings were converted to wells for purposes of investigating the potential presence of mobile NAPL. The borings were installed using HSA drilling equipment to approximate depths of 39 and 42 feet bgs, respectively.

During the drilling of MW-12 and MW-13, soil samples were collected continuously to the bottom of the borings for purposes of lithologic logging. Field screening was performed at 5-foot intervals. Select soil samples from both of these two well borings

were submitted for chemical analyses for chlorinated phenols, PAHs, and TPH-D. Soil sample intervals retained for chemical analyses were selected based on the selection criteria described in the *SI Work Plan*.

Old Butt Tank Area

Five shallow soil borings (SB-47 through SB-51) were installed in the area near former boring SB-2 where a PCP treatment solution spill from the Old Butt Tank reportedly accumulated in 1990 (Figure 7-2). The borings were located with the assistance of facility personnel who observed the location of the spill accumulation. The purpose of these borings was not to laterally and/or vertically delineate any COPCs in this area, but to determine if this area warrants further investigation. One boring was placed in the approximate center of the reported former spill accumulation area, and the other four borings were located approximately 25 feet away from the center boring at cardinal positions. Each boring was advanced to approximately 5 feet bgs using DPT equipment. Samples were collected continuously from each boring for purposes of lithologic logging and field screening. One soil sample, vertically composited from the 4 to 6 feet bgs interval from each boring, was selected and analyzed for chlorinated phenols and TPH-D. Soil sample intervals retained for chemical analyses were selected based on the selection criteria described in the *SI Work Plan*.

7.1.2 Task 1.2 – Groundwater Investigation

Groundwater monitoring wells and grab groundwater borehole locations are shown on Figures 7-2 and Figure 7-3. Well completion details are shown on the boring logs provided in Appendix C. Well installation, development, and sampling procedures were performed in accordance with the *SI Work Plan*.

Two groundwater monitoring wells (MW-10 and MW-11) were installed to investigate groundwater quality in the vicinity of the Main Treatment Area. Well MW-10 was installed near former catch basin CB24. The purpose of MW-10 was to evaluate

groundwater quality downgradient of the paved former drip area used between 1981 and 1991 (Figure 2-3; Section 2.2). Well MW-11 was installed upgradient of the Main Treatment Area near the eastern facility boundary to gather groundwater elevation and flow data, and to evaluate groundwater quality in this portion of the facility (Figure 7-3).

Groundwater monitoring wells MW-10 and MW-11 were constructed using 2-inch diameter, Schedule 40 PVC casing with 25 feet of 0.020-inch factory slotted screen. The total depth of well MW-10 is approximately 43 feet bgs. This is approximately 10 feet below the seasonal low water table estimated to be at 40 feet bgs in this portion of the facility. The total depth of well MW-11 is approximately 38 feet bgs. The well depths for MW-10 and MW-11 are approximately 13 to 8 feet below the seasonal low water table, respectively, which is thought to be approximately 30 feet bgs in this portion of the facility. The wells were developed in accordance with the procedures and methodology described in the *SI Work Plan*.

Wells MW-12 and MW-13 were installed primarily for the purpose of investigating previously reported NAPL. However, in accordance with the *SI Work Plan*, where NAPL failed to accumulate in one or both of these wells, groundwater samples were to be collected and analyzed for chlorinated phenols, TPH-D, and PAHs. During well development for MW-12 and MW-13, a relatively low rate of pumping was used to induce NAPL to flow into the well without causing excessive draw down which can lead to smearing of the NAPL. One groundwater sample was collected from MW-13 for the above referenced parameters. Since that monitoring event, LNAPL has been present in both MW-12 and MW-13. Well completion details are provided below in Section 7.1.3.

7.1.3 Task 1.3 – NAPL Investigation

As described in the preceding section, wells MW-12 and MW-13 were installed in an attempt to collect mobile NAPL samples and collect additional data that might aid in the design of NAPL recovery wells if mobile NAPL was to be found present at recoverable

quantities in either of these two wells. Well locations were selected based on historical data as provided in Section 5 (Nature and Extent) and Section 6 (Conceptual Site Model) of the *SI Work Plan*.

Wells MW-12 and MW-13 were installed near former borings BT-W and SB-30, respectively, in which NAPL was observed near the groundwater interface in previous investigations (Figures 7-2 and 7-3). Well borings for MW-12 and MW-13 were installed using HSA drilling equipment to depths of approximately 39 and 42 feet bgs, respectively. The total depths for MW-12 and MW-13 are approximately 4 and 7 feet below the seasonal low water table as observed in existing Well MW-1 (approximately 35 feet bgs). Soil samples were collected continuously to the bottom of the boring for lithologic logging purposes. Field screening occurred at 5-foot intervals.

Wells MW-12 and MW-13 were constructed using 4-inch diameter stainless-steel casing. Well MW-12 was completed at a depth of approximately 38 feet bgs with 20 feet of factory-slotted stainless steel well screen. Well MW-13 was completed at a depth of approximately 37 feet bgs with 20 feet of factory-slotted stainless steel well screen.

To investigate the potential for DNAPL in the Main Treatment Area, the *SI Work Plan* proposed that four deep soil borings be installed in this area. However, upon completion of two of these borings and evaluation of the collected data, EPA agreed that the first two deep borings (SB-2D and SB-3D) provided sufficient information to make the argument that no DNAPL bodies of significant size are present within the Main Treatment Area.

Deep borings SB-2D and SB-3D were installed both west and north of the paved former drip pad area (Figure 7-2). Borings SB-2D and SB-3D were installed using sonic drilling techniques until an aquitard was reached in both borings. The aquitard was reached at SB-2D and SB-3D at depths of 103.5 and 102 feet bgs, respectively. Soil samples were collected continuously for lithologic logging purposes and potential chemical analyses. Field screening was performed at 5-foot intervals. Three soil samples were collected from

both SB-2D and SB-3D from within the saturated zone and submitted for analysis for chlorinated phenols, TPH-D, and PAHs.

7.2 Treated Pole Storage Area Investigations

Soil, sediment, and groundwater investigations conducted to address the nature and extent of COPCs in the Treated Pole Storage Area are presented in this section. Soil, sediment, and groundwater sample stations within the Treated Pole Storage Area are shown on Figures 7-1 through 7-3.

7.2.1 Task 2.1 – Surface Soil Investigation

Fourteen surface soil samples (SS01 through SS14) were collected from within the Treated Pole Storage Area to determine the general nature and extent of COPCs in surface soil within this area. Four sampling grids were established across the area: one south of the Main Treatment Area, one north, one east, and one west. Sample grids and grid sectors are shown in detail in the *SI Work Plan*. The samples were collected randomly from each grid as described below:

North. The grid north of the Main Treatment Area was composed of seven sectors. Each sector consisted of nine polygons. One sample station was selected in a single polygon from each sector. The polygons were numbered 1 through 9 and the polygon sampled was selected using a random number generator. Samples SS01 through SS07 were collected from this area

South. The grid south of the Main Treatment Area was composed of two sectors. Each sector consisted of nine polygons. One sample station was selected in a single polygon from each sector. The polygons were numbered 1 through 9 and the polygon that was

sampling was selected using a random number generator. Samples SS13 and SS14 were collected from this area.

East. The grid east of the Main Treatment Area was composed of three sectors. Each sector consisted of nine polygons. One sample station was selected in a single polygon from each sector. The polygons were numbered 1 through 9 and the polygon sampled was selected using a random number generator. Samples SS10 through SS12 were collected from this area.

West. The grid west of the Main Treatment Area was composed of one sector consisting of nine polygons. One sample station was selected in a single polygon from the sector. The polygons were numbered 1 through 9 and the polygon sampled was selected using a random number generator. In addition to the randomly selected sample station in this area, one sample station (SS-8) was located adjacent to the drip pad apron at the request of EPA (Figure 7-1).

Two soil samples were collected at each surface soil sample station. One sample was collected from 0 to 2 inches, and one was collected from a vertical composite of the 6- to 18-inch interval. All soil samples were collected using hand tools. Soil samples collected from this area were field screened using sheen tests, visual observations, odor, and a PID. All samples were analyzed for chlorinated phenols and TPH-D, and seven of the 6- to 18-inch depth interval samples (approximately 50%) were randomly selected for PAH analysis. Of all the samples collected in this area, three (approximately 10%) were randomly selected for PCDD/PCDF analysis. In addition, three of the samples were randomly selected and analyzed for pH and total organic carbon (TOC) and extracted by synthetic precipitation leaching procedure (SPLP) with the extract being subsequently analyzed for chlorinated phenols. Where a randomly selected surface soil sample station was obstructed by structures such as buildings, treatment equipment, pole peelers, or other obstructions such as standing water or stored poles, it was necessary to relocate the

sample station. The polygons, as delineated in the *SI Work Plan*, were large enough such that an unobstructed location was available for sampling in each polygon.

7.2.2 Task 2.2 – Sediment Investigation

Sediment samples were collected from the ditches west and north of the Treated Pole Storage Area in order to assess the general extent of COPCs in these ditches, as well as to collect data to be used in estimating the concentrations of COPCs potentially leaching into stormwater infiltrating through the ditches. The number of samples and locations of the samples were predetermined to encompass all onsite ditches as well as ditches adjacent to the facility.

Discrete ditch sediment samples D-1, D-2, and D-5 through D-7 were collected from the upper 0- to 6-inch depth interval of the ditches (Figure 7-1). Samples D-1 and D-2 were collected from the onsite ditch west of the Treated Pole Storage Area and west of the Main Treatment Area. Samples D-5 and D-6 were collected from the northern section of the ditch west of the Treated Pole Storage Area. Sample D-7 was collected from the ditch north of the Treated Pole Storage Area. In the *SI Work Plan*, ditch samples were proposed to be collected near the eastern property boundary from the railroad ditch. However, right-of-access to the Burlington Northern property could not successfully be obtained. Actual ditch sample locations are shown on Figure 7-1. Sediment samples were analyzed for chlorinated phenols, TPH-D, pH, and TOC. Samples were also extracted using SPLP, and the extract was analyzed for chlorinated phenols.

7.3 Untreated Pole Storage Area Investigations

Soil and groundwater investigations to address the nature and extent of COPCs in the Untreated Pole Storage Area are presented in this section. Soil and groundwater sample stations are shown on Figures 7-1 through 7-3. Well installation, development, and

sampling procedures were performed in accordance with the *SI Work Plan*. Monitoring well completion details are shown on the boring logs provided in Appendix C.

7.3.1 Task 3.1 - Soil Investigation

Surface soil samples were collected at random locations from the Untreated Pole Storage Area. Six shallow borings (SB-52 through SB-58) were installed adjacent to catch basin drains in this area. The purpose of these borings was to evaluate the potential for stormwater in the Untreated Pole Storage Area to be a source of COPCs to soil and groundwater. Screening-level grab groundwater samples were collected from each of these borings. In addition, three borings were installed along the southern property boundary to evaluate the potential for stormwater and overland flow to be a source of COPCs to shallow soils in this portion of the facility. Two of these borings (SB-59 and SB-60) were completed at shallow depths (approximately 6 feet bgs), and one (MW-14) was extended to groundwater (total depth of 38 feet bgs) for purposes of constructing a monitoring well which was used to gather more data on groundwater elevation, flow, and quality at the southern facility boundary.

7.3.1.1 Task 3.1.1 – Surface Soil Investigation

Surface soil samples were collected initially at nine locations (SS15 through SS23) in the Untreated Pole Storage Area. A grid was established across the area and divided into nine sectors. Each sector consisted of nine polygons. One sample station was selected in a single polygon from each sector. The polygons were numbered 1 through 9 and the polygon sampled was selected using a random number generator. This procedure resulted in one surface soil sample station for each of the nine sectors in the Untreated Pole Storage Area. Sample grids and grid sectors are shown in detail in the *SI Work Plan*.

Two samples were collected at each sample station. One sample was collected from 0 to 2 inches, and one was collected from a vertical composite of the 6- to 18-inch depth

interval. All samples were analyzed for chlorinated phenols and TPH-D; four of the samples (approximately 20%) were randomly selected for PAH analysis, and two of the samples (approximately 10%) were randomly selected for PCDD/PCDF analysis. In addition, three of the samples were randomly selected and analyzed for pH and TOC and extracted by SPLP with the extract being subsequently analyzed for chlorinated phenols. All surface soil samples were collected using hand tools.

Evaluation of the resultant analytical data indicated elevated concentrations of PAHs were present in surface soil sample SS18 (subsequently renamed SS18A). In an effort to determine if the presence of PAHs at SS18A was anomalous, and in an effort to determine the lateral extent of PAHs at this location, two additional surface soil samples were collected. Surface soil samples SS-18B and SS-18C were collected approximately 5 feet north and 5 feet south of SS-18A. At each location one sample was collected from a vertical composite of the 6- to 18-inch depth interval and submitted for PAH analysis.

7.3.1.2 Task 3.1.2 – Subsurface Soil Investigation

Seven soil borings were installed to evaluate the potential for stormwater in the Untreated Pole Storage Area to be a source of COPCs to soil and groundwater. Borings SB-52 through SB-58 were drilled adjacent to selected Untreated Pole Storage Area catch basins using DPT equipment (Figure 7-2). Selected boring locations were either near catch basins in which the highest PCP concentrations have historically been detected in stormwater, or placed to provide coverage in the vicinity of the catch basins. Soil samples were collected continuously from each boring to five feet below first-encountered groundwater. The borings were completed to depths ranging from 29 to 36 feet bgs. Two soil samples from each boring were analyzed for chlorinated phenols and TPH-D. The first soil sample at each location was collected near the base of the catch basins. The *SI Work Plan* called for the second sample to be collected from the interval exhibiting the greatest evidence of COPCs based on the results of field screening. If no evidence of COPCs was observed, then the second sample was to be collected from a depth

approximately halfway to the water table. Since no evidence of COPCs was observed during boring installation, the second sample from each boring was collected from a depth approximately halfway to the water table. All seven of these borings were abandoned after sample collection in accordance with procedures outlined in the *SI Work Plan*.

Three soil boring (SB-59, SB-60, and MW-14) were installed near the southern facility boundary to evaluate the potential for stormwater and overland flow to be a potential source of COPCs to shallow soils (Figures 7-2 and 7-3). The borings were sampled continuously for lithologic logging and field screening purposes. One sample was collected from each boring from the 4- to 6-foot interval. Borings SB-59 and SB-60 were terminated at approximately 6 feet bgs. Boring MW-14 was advanced to groundwater and completed as a groundwater monitoring well. Samples retained for analyses from the borings were analyzed for chlorinated phenols, PAHs, and TPH-D.

7.3.2 Task 3.2 – Groundwater Investigation

In order to evaluate the possible effects of stormwater infiltration from the Untreated Pole Storage Area on groundwater quality, screening-level grab groundwater samples were collected from Borings SB-52 through SB-58 (Figure 7-2). Grab groundwater samples collected from Borings SB-52 through SB-58 were analyzed for chlorinated phenols. Analysis of the screening-level grab groundwater samples was expected to provide qualitative data only, due to the anticipated turbidity, and was only to be used to assess the general geometry of the plume.

Due to a lack of hydrogeologic data in the southern portion of the facility, one groundwater monitoring well (MW-14) was installed on the southern property boundary for the primary purpose of providing additional groundwater elevation and data for determining groundwater flow direction (Figure 7-3).

Groundwater monitoring well MW-14 was constructed using 2-inch diameter, Schedule 40 PVC casing. The total depth of well MW-14 is approximately 38 feet bgs, which was approximately 10 feet below first-encountered groundwater at the time of installation. Well MW-14 was developed in accordance with the procedures and methodology described in the SADMP. Groundwater samples collected from this well were analyzed for chlorinated phenols.

7.4 Investigation of Other Areas

This section describes soil and groundwater investigation activities conducted to address the nature and extent of COPCs in areas outside of the Main Treatment Area, the Treated Pole Storage Area, and the Untreated Pole Storage Area. Well completion details are shown on the boring logs provided in Appendix C. Soil and groundwater sample stations are shown on Figures 7-1 through 7-3.

7.4.1 Penta Storage Area Investigation

One composite surface soil sample (SS25) was collected from the upper six inches of soil by the loading area of the Penta Storage Building to evaluate COPCs in this area (Figure 7-1). The sample was composited from five points around the entrance to the building where materials are loaded and unloaded. The sample was analyzed for chlorinated phenols, PAHs, and TPH-D. The soil sample consisted of five subsamples: one subsample collected at the center of the sampling station, and four other subsamples located approximately 10 feet away from the center at cardinal positions. The center of the sampling station was pre-selected to be 15 feet east of the center of the door through which materials are loaded and unloaded.

7.4.2 Groundwater Investigation – Northwest Parcel

Information provided in Section 5 (Nature and Extent) and Section 6 (Conceptual Site Model) of the *SI Work Plan* indicated groundwater affected with site-related COPCs was potentially migrating to the Northwest Parcel, located north of the closed Wood Waste Landfill. In order to evaluate potential groundwater migration and to appropriately locate groundwater wells for long-term plume monitoring, the *SI Work Plan* called for at least four soil borings (SB-43 through SB-46) to be installed in the Northwest Parcel perpendicular to the groundwater flow direction (Figure 7-2). These borings were installed using DPT equipment, and soil samples were collected continuously for lithologic logging purposes. Field screening of soil was performed at 5-foot intervals. Each boring was advanced to approximately five feet below the water table for purposes of obtaining screening-level grab groundwater samples. Analysis of these grab groundwater samples was intended only to provide qualitative data regarding the general geometry of the dissolved-phase groundwater plume. One grab groundwater sample was collected from each boring by placing 1-inch schedule 40 PVC casing with 10 feet of 0.010-inch factory slotted screen in each borehole and collecting the sample using small-diameter Teflon tubing with a check valve at the base of the tubing. Submersible pumps could not be used in DPT boreholes due to the limited borehole diameter. The slotted screen was placed at the bottom of each borehole. Using such temporary well casing allows for the collection of a more representative groundwater sample than a shielded screen drive point sampler. The samples were analyzed for chlorinated phenols, TPH-D, and PAHs.

Concentrations of COPCs were detected in grab groundwater samples collected from all four borings. At the request of EPA, two additional borings (SB-64 and SB-65) were located in between borings SB-43 through SB-46, and well MW-3 located near the northwest corner of the Main Treatment Area for the intended purpose of evaluating groundwater quality in this area. During the consultation with EPA in which grab groundwater data was reviewed, it was agreed that a groundwater monitoring well

(MW-15) be installed hydraulically downgradient from borings SB-43 through SB-46 to evaluate groundwater quality at this area (Figures 7-2 and 7-3).

Well MW-15 was constructed using 2-inch diameter, Schedule 40 PVC casing. The total depth of well MW-15 is approximately 50 feet bgs, which at the time of installation was approximately 10 feet below first encountered groundwater. Well MW-15 was developed in accordance with the procedures and methodology described in the *SI Work Plan*.

The screening-level groundwater quality data from boreholes SB-43 through SB-46, and SB-64 and SB-65, and the groundwater quality data for samples collected from well MW-15 indicated that these boreholes and well failed to completely delineate the dissolved-phase groundwater plume onsite. Additional onsite and offsite groundwater investigative activities were proposed to EPA as an addendum to the *SI Work Plan* (*Addendum B: Supplemental Groundwater Investigation Work Plan*) pursuant to Section XII of the AOC. These proposed activities subsequently received EPA approval and were performed.

Additional onsite groundwater investigation activities as proposed and subsequently approved by EPA in Addendum B to the *SI Work Plan* included the installation of two additional groundwater monitoring wells (MW-16 and MW-17) in the Northwest Parcel near the northwest property boundary (Figure 7-3). Well borings for MW-16 and MW-17 were installed using HSA drilling equipment to depths of approximately 50 and 55 feet bgs, respectively. Soil samples were collected continuously to the bottom of each boring for lithologic logging purposes. These two wells were constructed using 2-inch diameter, Schedule 40 PVC casing. The wells were developed in accordance with the procedures and methodology described in the *SI Work Plan*.

7.4.3 Offsite Groundwater Investigation

Offsite groundwater investigative activities were proposed to EPA as an addendum to the *SI Work Plan (Addendum B: Supplemental Groundwater Investigation Work Plan)* pursuant to Section XII of the AOC. These proposed activities subsequently received EPA approval and were performed.

Offsite groundwater investigative activities consisted of the installation of one additional groundwater monitoring well (MW-18) across 188th Street NE in the public right-of-way (Figure 7-3). The well boring for MW-18 was installed using HSA drilling equipment to a total depth of approximately 55 feet bgs. Soil samples were collected continuously to the bottom of the boring for lithologic logging purposes. Well MW-18 was constructed using 2-inch diameter, Schedule 40 PVC casing, in accordance with the *SI Work Plan*.

7.4.4 Groundwater Investigation – Appendix IX Constituents

To address the potential presence of other COPCs not yet considered in the facility investigation, two groundwater samples were collected and analyzed for the full suite of RCRA Appendix IX constituents. In accordance with the EPA-approved *SI Work Plan*, wells MW-3 and MW-10 (Figure 7-3) were selected for this purpose as they are outside the area where NAPL (which can cause interference in accurate analysis of many of the RCRA Appendix IX constituents) was previously observed, yet are hydraulically downgradient of the area where the treatment operations have occurred during the wood treating history of the facility.

7.5 Air Quality Assessment

7.5.1 Predictive Modeling

The Air Quality Assessment was conducted in accordance with the *SI Work Plan* for the Arlington facility, and the subsequent EPA-approved *Addendum A: Revised Air Quality Assessment* to the *SI Work Plan*. COPC emissions from the Arlington facility were modeled to estimate the downwind concentrations at the facility boundary and beyond. Modeled concentrations of COPCs are based on emissions from the Baxter facility that occurred during 2001. No substantial changes in the treatment system or volumes of treated wood have occurred since 2001.

The air quality assessment included the identification of COPCs and the development of an air emissions inventory for the Arlington facility considering EPA and Ecology regulations and the results of the facility characterization studies to date. The air quality assessment included the following chemicals:

- PCP;
- PCDDs/PCDFs;
- Carcinogenic PAHs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, and chrysene);
- Naphthalene;
- Benzene; and
- Trimethylbenzenes.

The Arlington facility COPC emissions were evaluated with a computer-based air dispersion model. The model used to complete the evaluation was the EPA Industrial Source Complex-Short Term (ISCST3) dispersion model with the Plume Rise Model Enhancements (PRIME). The ISCST3 model predicts the concentration of a pollutant at user-specified locations using information such as emission source data and atmospheric conditions. The required inputs for this model include source data, meteorological data, and receptor data.

Meteorological data that is representative of the Arlington facility was available from the Arlington, Washington airport; however, it is of poor quality due to numerous missing data points. Due to the poor quality of the Arlington data, a screening-level air dispersion modeling analysis was conducted. In this analysis, ISCST3-PRIME was employed using the meteorological data regimes that are employed in EPA's SCREEN3 screening model. The model was run initially with the SCREEN3 meteorological conditions because SCREEN3 employs a generic worst-case matrix of meteorological conditions. The model was used to estimate the annual average airborne concentration of each COPC for a SCREEN3 data set and a data set obtained from the Bellingham, Washington air station.

A complete description of the modeling and results is presented in Appendix D.

7.5.2 Offsite Surface Soil Sampling/Deposition Analysis

To determine the extent, if any, to which process chemicals have been transported via the air pathway with subsequent deposition to offsite soil, surface soil samples were collected adjacent to the facility boundary and measured for PCP, PAHs, dioxin, benzene, and trimethylbenzenes. Because dust generated from site activities may be transported beyond site boundaries, sampling was limited to the 0- to 2-inch depth interval.

Samples were collected at five offsite locations shown on Figure 7-4 (SS120-124). The five locations were chosen based on the nearest offsite location with respect to the Main Treatment Area. Sample locations were primarily located north (SS122 and SS123) and east (SS120 and SS121) of the Main Treatment Area. Additionally, a sample was collected to the northwest of the Main Treatment Area (SS124).

Samples were collected September 29 through September 30, 2003, in accordance with sampling procedures outlined in the *SI Work Plan and Addendum A*. Additional details of the sampling activities are provided in Appendix D.

7.6 Background Soil Sampling

Soil samples were collected from locations in the vicinity of the Arlington facility to establish background concentrations of COPCs. The background soil sampling was conducted in accordance with WAC 173-340-709, *Methods for Defining Background Concentrations*. Soil samples were collected from areas subject to influences similar to those present at the facility and adjacent to the area (i.e., highway traffic, wood burning, etc.) but exclusive of those attributed to operations at the facility (i.e., wood treatment).

Twenty background sample locations (SS100 through SS119) were selected in the facility vicinity and are shown on Figure 7-4. At each location, one composite soil sample was collected. Each composite sample consisted of five subsamples: one collected at the center of the sampling station, and four other subsamples located approximately ten feet away from the center at cardinal positions. Subsamples for each composite sample were a vertical composite of the 0- to 6-inch depth interval. All of the composite soil samples were analyzed for chlorinated phenols, PAHs, TPH-D, and PCDD/PCDFs.

7.7 Data Evaluation

QA and QC review and data validation was conducted to confirm that data collected complied with analytical methods and control limits as defined in the SADMP (Appendix B of the *SI Work Plan*). Guidance for the data validation was obtained from QA/R-5, *EPA Requirements for Quality Assurance Project Plans* (EPA 1999) and QA/G-5, *EPA Guidance for Quality Assurance Project Plans* (EPA 1998). A QA review of the organic and conventional data was performed using *Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8, 6/2001)* (EPA 2001b) and EPA's functional guidelines (EPA 1994a, 1994b) in the context of data quality objectives specified in the SADMP. In addition, *Region 10, Functional Guidelines for the Validation of High Resolution Mass Spectrometry (HRMS) Analysis of Polychlorinated Dibenzodioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Data, Revision 5, 7/16/01* (EPA 2001c) was used to validate project PCDD/PCDF data.

The initial sampling phase of the SI began in August 2002 and was completed in January 2003. During the initial phase, groundwater and surface soil samples were collected and analyzed as directed in the *SI Work Plan* and associated SADMP.

The groundwater, soil, and sediment samples collected during the initial phase of the SI were analyzed for constituents related to wood treatment by one or more of the following methods:

- Chlorinated phenols by EPA SW-846 Method 8151
- PAHs by EPA SW-846 Method 8270C SIM
- Semivolatile petroleum products by WDOE Method NWTPH-Dx
- PCDDs/PCDFs by EPA Method 1613B
- Synthetic precipitation leaching procedure for chlorinated phenols by EPA Method SW-846 1312/8151

- Total solids by EPA Method 160.3
- TOC by ASTM Method D4129-82M
- pH by EPA SW-846 Method 9045C

Two groundwater samples (MW-3 and MW-10) collected during the initial phase of the SI were analyzed for Appendix IX constituents as required by the SADMP. The following analytical methods were used:

- Organophosphorus pesticides by EPA SW-846 Method 8141A
- Chlorophenoxy herbicides by EPA SW-846 Method 8151A
- Volatile organic compounds by EPA SW-846 Method 8260B
- Semivolatile organic compounds by EPA SW-846 Method 8270C
- PCDDs/PCDFs by EPA Method 1613B
- Polychlorinated biphenyls (PCBs) by EPA SW-846 Method 3520C/8082
- Total metals (Ba, Be, Cd, Cr, Co, Cu, Fe, Ni, Ag, Sn, Zn, and V) by EPA SW-846 Method 6010B
- Total antimony, arsenic, lead, mercury, selenium, and thallium by EPA SW-846 Methods 7041, 7060A, 7421, 7470A, 7740A, and 7841
- Chloride by EPA Method 300.0 or EPA Method 335.2
- Sulfide by EPA SW-846 Method 9030B/9034
- Total suspended solids by EPA Method 160.2

The groundwater monitoring phase of the SI was conducted between 2002 and 2004. Groundwater samples have been analyzed for constituents related to wood treatment by the following methods.

- PAHs by EPA SW-846 Method 3535/8270C selective ion monitoring

- Chlorinated phenols by EPA SW-846 Method 8151
- Semivolatile petroleum hydrocarbons by Washington Department of Ecology Method NWTPH-Dx
- Dissolved calcium, iron, magnesium, potassium, sodium, and total copper and iron by EPA SW-846 Method 6010B
- Total suspended solids by EPA Method 160.2
- Chloride by EPA Method 300.0
- PCDDs/PCDFs by EPA Method 1613B

Samples collected during the initial and monitoring phases of the SI were analyzed by Columbia Analytical Services (CAS). Complete data packages and electronic data deliverable (EDD) files were provided by CAS.

Sample data from the initial phase of the SI were fully validated by Premier using contract lab procedure (CLP) type validation. At the conclusion of the initial phase of data collection and validation, a request was made to EPA to lower the level of validation to Level III. The request was granted and a Level III data validation review was performed on all monitoring phase sample data. The validation review was documented on worksheets (archived by Premier) and validation memoranda. The validation qualifier flags were applied to the hardcopy data and Premier database tables created from the laboratory EDD files. The validation memos and copies of qualified hardcopy data were provided to EPA with the monthly progress reports. The validation memos are presented in Appendix E.

State Waste Discharge Permit samples were collected concurrently with the SI monitoring samples. Analytical results for these samples were validated with the SI samples and were included in the validation memos.

The quality and usability of the SI data are summarized in the validation memos. In general, the data quality objectives established in the SADMP were met, and the quality of the data is acceptable and useable.

7.8 Deviations from the SI Work Plan

Significant deviations from the scope of work described in the *SI Work Plan* are described as follows:

- The *SI Work Plan* proposed that five sediment samples were to be collected offsite from the Railroad Ditch on the eastern edge of the facility. Due to the inability to obtain right-of-access with Burlington Northern Railroad, these samples were not collected. In a meeting with EPA in February 2003, it was agreed that these data would not be required.
- Sections 7 and 8 of the *SI Work Plan* proposed that NAPL-sensitive dyes or alternate qualitative NAPL detection methods were to be used as a field screening technique to evaluate the potential presence of DNAPL in subsurface soils in the saturated zone during the installation of deep borings proposed as part of the DNAPL investigation. As a result of conversations and subsequent agreements reached with EPA regarding the *SI Work Plan*, NAPL-sensitive dyes were not used. Also as a result of conversations and subsequent agreements reached with EPA, sonic drilling techniques were used for the installation of the deep borings. While the *SI Work Plan* proposed that screening-level grab groundwater samples be collected every 10 feet from these deep borings and retained for possible chemical analyses, sonic drilling techniques do not allow for the collection of groundwater samples during borehole installation. Therefore, such groundwater samples were not collected during deep borehole installation.

- To investigate the potential for DNAPL in the Main Treatment Area, four deep soil borings were proposed to be installed in the *SI Work Plan*. However, upon completion of two of these borings and evaluation of the collected data, EPA agreed that the first two deep borings (SB-2D and SB-3D) provided sufficient information to make the argument that no DNAPL bodies of significant size are present within the Main Treatment Area.

8 Nature and Extent of COPCs

This section summarizes the known occurrence of COPCs at the Arlington facility in soil, sediment, pore water, groundwater, and air. This summary is based on review of the documents listed in the references, results from previous investigations, and the SI activities. All of the available data for the Arlington facility is presented in the comprehensive chemical database included in Appendix A. Stormwater was not included as part of the SI activities, and is not discussed in this section. However, stormwater data collected at the facility as part of the NPDES or SWDP is included in Appendix A.

COPCs discussed in this section include chemicals that have been used at the facility and/or have been detected during previous investigations. When considering the distribution and concentrations of COPCs in subsurface soil, it should be noted that not all samples collected were analyzed for all COPCs. The primary COPCs include PCP, TPH, PAHs, and PCDD/PCDFs. The COPCs are described in more detail in the beginning of Section 9 (Conceptual Site Model).

Tabular summaries of COPCs detected at the facility during previous investigations and the SI are provided in Tables 8-1 through 8-7 for surface soil, subsurface soil, sediment, vadose zone porewater, groundwater, and offsite soil. These tabular summaries present the number of samples analyzed for each media, the number of detections, the range of concentrations, and the station name with the highest concentration. In addition, the number of detections above, residential and industrial PRGs are shown for the individual COPCs.

In the summary tables and the discussions below, analytical results are reported in accordance with standard industry practice. Soil results are reported in mg/kg. Aqueous

results are typically presented in $\mu\text{g/L}$; however, some conventional analytes (i.e., TSS) are reported in mg/L . PCDD/PCDF concentrations are reported as the toxicity equivalent quotient (TEQ) of 2,3,7,8-TCDD, which adjusts the concentration of particular PCDD/PCDF congeners using the toxicity equivalent factors (TEFs) outlined by the World Health Organization (WHO 1998). Soil TEQs are reported in pg/g ; aqueous TEQs are reported in pg/L .

Concentrations of PCP, total PAH, diesel range organics (DRO), and TEQ (for surface soil and groundwater only), where available, are presented for surface soil, subsurface soil, sediments, and groundwater collected during the SI in Figures 8-1 through 8-9. These figures do not include data from previous investigations.

8.1 Surface Soil

Surface soils are defined in this document as being from the 0- to 4-foot depth interval. Samples collected from depths greater than 4 feet are designated as subsurface soil. For clarity, only subsurface data from SI boreholes are presented in the figures; additional data from previous investigation are presented in Appendix A.

Surface soil data include four samples obtained by Ecology in 1992, 12 samples collected by Baxter in 1999, six soil samples collected from borings at the 2.5- to 4-foot depth interval, 31 soil samples collected from the 0- to 2 inch depth interval during the SI, 26 soil samples collected from the 6- to 18-inch depth interval during the SI, and 21 soil samples collected from the 0- to 6-inch depth interval. Of the 94 surface soil samples collected, 67 were collected onsite at the Arlington facility, seven were collected from adjacent properties, and 20 were collected throughout the City of Arlington to establish background concentrations of Arlington facility COPCs. Chlorophenols, petroleum hydrocarbons, PAHs, and PCDD/PCDFs were detected in these samples as described below.

8.1.1 Chlorinated Phenols in Surface Soil

PCP has been detected in surface soils across the Arlington facility, primarily in the Main Treatment Area and the Treated Pole Storage Area. During previous investigations, the highest PCP concentrations in surface soil were detected in a sample collected by Ecology in 1992 (#42; 1,900 mg/kg). Surface soil samples collected by Baxter between 1999 and 2000 indicated PCP concentrations of up to 90 mg/kg (SS-3) in the Treated Pole Storage Area (SS-3; 90 mg/kg); and up to 110 mg/kg at the 2.5-foot depth (SB-5) located east of the drip pads (110 mg/kg) (Figure 3-1).

PCP has also been detected in surface soils outside of the Main Treatment Area and Treated Pole Storage Area at lower concentrations than previous investigations. On the property immediately east of the facility, PCP concentrations at SS-6-S (shallow) and SS-6-D (deeper) were 0.022 and 0.015 mg/kg, respectively. PCP was also detected at 0.033 mg/kg (HCMW-5) to 0.16 mg/kg (SB-2) in surface soil in a section of the Treated Pole Storage Area located just south of the Main Treatment Area (Figure 3-1).

For surface soil samples collected from a random grid during the SI, the highest PCP concentrations in surface soils in the Main Treatment Area and the Treated Pole Storage Area were detected in sample SS09 (10 mg/kg) in the 0- to 2-inch sampling interval and SS10 (2 mg/kg) in the 6- to 18-inch sampling interval. The one surface soil sample collected from the 0- to 6-inch sampling interval (SS25) contained a concentration of PCP of 1.9 mg/kg (Figure 8-1).

During previous site investigations, TeCP were detected in five surface soil samples in Parcel A at concentrations ranging between 0.0096 and 10 mg/kg (Appendix A). During the SI, TeCP were detected in onsite surface soils at concentrations up to 0.130 mg/kg (SS10: 6- to 18-inch interval). Trichlorophenols (TCP) were not detected in surface soil samples collected and analyzed from the facility during previous investigations or during the SI (Table 8-1).

8.1.2 TPH in Surface Soil

TPH-D were detected in four of five pre-SI surface soil samples analyzed for TPH. TPH-D was detected in sample SS-2-D (deep) at 1,400 mg/kg. Oil-range petroleum hydrocarbons (TPH-O) were detected in three samples at concentrations between 60 (estimated) mg/kg and 630 mg/kg (Appendix A).

DRO were detected in onsite surface soil samples collected during the SI at concentrations up to 2,100 mg/kg (SS10: 6-18 in.). TPH concentrations are summarized in Table 8-1, and presented in Appendix A. DRO concentrations are also shown in Figure 8-1.

8.1.3 PAHs in Surface Soil

PAHs were detected in surface soils in the Main Treatment Area and Treated Pole Storage Area during the 1992 Ecology investigation. Detected total PAH concentrations ranged between 2.2 and 34.7 mg/kg (Table 8-1). Until the SI was conducted, no other PAH data was available for surface soil.

For surface soil samples collected onsite during the SI, the highest total PAH concentration in surface soil were detected in samples SS18A (1.043 mg/kg) in the 6- to 18-inch sampling interval. Samples collected onsite from the 0- to 2-inch sampling interval during the SI were not analyzed for PAHs. Total PAH concentrations are shown for all SI surface soil samples on Figure 8-1. Data are summarized in Table 8-1 and presented in Appendix A.

8.1.4 PCDD/PCDFs in Surface Soil

During previous investigations, PCDD/PCDFs were detected in surface soils in the Main Treatment Area and Treated Pole Storage Area at concentrations ranging between

1,032 and 6,400 pg/g, expressed in terms of TEQ relative to tetrachlorodibenzo-*p*-dioxin (TCDD) (Appendix A).

During the SI, PCDD/PCDFs were detected in onsite surface soils at concentrations ranging between 85 and 645 pg/g TEQ. PCDD/PCDF concentrations, expressed as TEQ, are shown for all SI surface soil samples on Figure 8-2. Data are summarized in Table 8-1, and presented in Appendix A.

8.2 Subsurface Soils

Subsurface soils are defined in this document as soils below four feet in depth. Of 82 subsurface soil samples collected for chemical analysis from previous investigations, 58 were collected from the Main Treatment Area, 23 were collected from the Treated Pole Storage Area, and one was collected offsite. Until the SI, no subsurface soil samples had been collected and analyzed from the Untreated Pole Storage Area.

Chlorophenols, TPH, PAHs, and PCDD/PCDFs were detected in these samples as described below. A detailed summary of analytical results is provided in Appendix A.

8.2.1 Chlorophenols in Subsurface Soils

PCP was detected onsite during previous investigations in the subsurface at concentrations ranging from not-detected to 1,900 mg/kg (1992 Ecology sample). TeCP was detected in 5 of 37 historic subsurface soil samples at concentrations between 0.03 and 40 mg/kg. TCP was not detected in subsurface soils during previous investigations (Appendix A).

During the SI, PCP was detected onsite at concentrations ranging from not detected to 1,300 mg/kg (SB-39). PCP concentrations are shown for all SI subsurface soil samples

are shown on Figures 8-3 through 8-6. Data are summarized in Table 8-2, and presented in Appendix A.

TeCP was detected in only 3 subsurface soil samples collected and analyzed during the SI with a maximum concentration of 390 mg/kg. TCP was not detected in subsurface soils during the SI (Table 8-2).

In 2002, the catch basins located in the Untreated Pole Storage Area were removed. Soil samples were collected from beneath seven of the catch basins (CB01, CB12, CB4, CB16, CB18, CB20, CB21) (Figure 2-1) after removal of the concrete vaults. PCP was detected beneath six of the catch basins at concentrations ranging from 0.011 mg/kg (CB12) to 0.750 mg/kg (CB16) (Appendix A). No TeCP or TCP was detected in any of the samples analyzed.

8.2.2 TPH in Subsurface Soils

TPH-D was detected in subsurface soils during previous investigations at concentrations ranging from not detected to 56,000 mg/kg in the Main Treatment Area, but was not detected anywhere else at the facility (Appendix A).

DRO was detected onsite during the SI in the subsurface at concentrations ranging from not detected to 45,000 mg/kg. DRO concentrations are shown for all SI subsurface surface soil samples are shown on Figures 8-3 through 8-6. Data are summarized in Table 8-2, and presented in Appendix A.

DRO and residual-range organics (RRO) were detected in five of the seven samples collected beneath the catch basins in the Untreated Pole Storage Area (Figure 2-1). DRO concentrations ranged from 36 mg/kg (CB01) to 160 mg/kg (CB16). RRO was also detected in five of the seven samples at concentrations ranging from 130 mg/kg (CB01) to 700 mg/kg (CB20). Analytical results for these samples are provided in Appendix A.

8.2.3 PAHs in Subsurface Soil

PAHs were detected in eight subsurface soil samples collected during previous investigations from the Main Treatment Area at concentrations ranging between 1.1 and 500 mg/kg total PAHs. Carcinogenic PAH (cPAH) concentrations in these samples ranged from not-detected to 6.2 mg/kg calculated using benzo(a)pyrene TEFs. PAH concentrations were highest in samples in which residual NAPL was observed in the Main Treatment Area (Figure 7-2). Analytical data for these pre-SI samples are provided in Appendix A.

During the SI, PAHs were detected in onsite subsurface soil samples at concentrations up to 1,372 mg/kg total PAHs (SB-39: 10-12 feet). PAH concentrations were highest in samples collected within the Main Treatment Area in which residual NAPL was observed (e.g., sample stations SB-37, SB-38, MW-13). Total PAH concentrations are shown for all SI subsurface surface soil samples on Figures 8-3 through 8-6. Data are summarized in Table 8-2 and presented in Appendix A.

8.2.4 PCDD/PCDFs in Subsurface Soil

PCDD/PCDF concentrations detected in subsurface soil samples collected during previous investigations from the Main Treatment Area ranged from 0.043 to 31 $\mu\text{g/kg}$ TEQ. The highest concentrations were detected in areas where NAPL was observed (Appendix A).

PCDD/PCDFs were also detected during previous investigations in subsurface soils near Ditch 1 and 2 (Borings L-1, L-2, and L-3) at concentrations ranging between 0.043 and 0.137 $\mu\text{g/kg}$ TEQ. The highest TEQ concentration in these three samples was located at L-3 (Figure 3-1).

Subsurface soils collected during the SI were not analyzed for PCDD/PCDFs.

8.2.5 NAPL in Subsurface Soil

Residual NAPL has been observed (based on visual staining and odor) during previous investigations in subsurface soils in the Main Treatment Area at depths ranging from approximately 12 to 36 feet bgs. The NAPL was observed during the installation of borings BTS, BTW, SB-21, SB-23, SB-24, SB-25, SB-27, SB-28, SB-30, SB-32, and SB-33.

Residual NAPL was also observed during the SI in subsurface soils in the Main Treatment Area at depths ranging from approximately 10 to 42 feet bgs. The NAPL was observed during the installation of borings MW-12, MW-13, SB-37, and SB-38 (Figures 7-2 and 7-3).

Mobile LNAPL (i.e., free-phase NAPL floating on the water table) has been observed in MW-12 and MW-13. The maximum recorded LNAPL thickness in MW-12 and MW-13 is 5.57 feet and 2.66 feet, respectively. NAPL thicknesses in these two wells are measured quarterly. A tabular summary of NAPL thickness measurements is included in Appendix A.

8.3 Sediments

During the SI, five sediment samples were collected from ditches present at the facility (Figure 8-7). In addition, 19 samples were collected and analyzed in 2004 as part of the ditch improvements (Figure 8-7). Additional information regarding the ditch improvements is included in Appendix B.

8.3.1 Chlorophenols in Sediment

During the SI, PCP was detected in all five of the stations sampled at concentrations ranging from 1.9 mg/kg to 11 mg/kg. The highest concentration was measured at station D5 in Ditch 2. Dichlorophenol (up to 2 mg/kg in D6) and tetrachlorophenol (up to 0.12 mg/kg in D6) were also detected in Ditch 2 (Table 8-3). SPLP analyses for PCP were also conducted on each of the sediment samples collected during the SI. SPLP concentrations ranged from 0.82 µg/L PCP to 2.2 µg/L PCP (Table 8-3).

As part of the ditch improvements, 19 samples were collected and analyzed for PCP. The highest concentration of PCP was 12 mg/kg in Ditch 2. Following receipt of initial sampling results, additional material was removed from Ditch 2. After the final phase of excavation in Ditch 2, detected concentrations of PCP ranged from 1.5 mg/kg to 7 mg/kg (Figure 8-7).

Samples were also collected from Ditch 1. Detected concentrations of PCP ranged from 1.6 mg/kg to 3.8 mg/kg (Figure 8-7).

8.3.2 TPH in Sediments

DRO were detected in sediments collected from the ditches during the SI at concentrations ranging from 140 mg/kg to 2,100 mg/kg (Table 8-3). RRO were also detected at concentrations ranging from 550 mg/kg to 8,900 mg/kg. The highest DRO and RRO concentrations were present at station D6 located at the north end of Ditch 2 (Figure 8-7).

8.4 Pore Water

In December 2000, three lysimeters (L-1 through L-3) were installed in the Main Treatment Area and Treated Pole Storage Area ditches as replacement monitoring points for the closed catch basins in these areas (Figure 3-1). The lysimeters are installed within the vadose zone beneath the drainage ditches at depths ranging from 17.5 to 19.5 feet bgs, just above the contact of the Gravelly Sand with the Fine Sand. Beginning in January 2001, lysimeters (L-1, L-2, and L-3) were monitored on the edge of the Treated Pole Storage Area every two months between September and May as required by the SWDP No. ST-7425. Lysimeter samples were analyzed for PCP, TPH, and PCDD/PCDFs. Lysimeter monitoring was discontinued in February 2005 when the SWTS was completed.

8.4.1 Chlorophenols in Pore Water

PCP was detected in L-1 only in January 2001 and December 2001 at concentrations of 27 $\mu\text{g/L}$ and 0.49 $\mu\text{g/L}$, respectively. PCP was detected in L-2 only in October 2002 at a concentration of 0.69 $\mu\text{g/L}$. PCP was detected in L-3 in December 2001, December 2002, and November 2003 at concentrations of 0.31 $\mu\text{g/L}$, 13.0 $\mu\text{g/L}$, and 0.15 $\mu\text{g/L}$, respectively. No other chlorinated phenols have been detected in lysimeter samples. Pore water analytical results are summarized in Table 8-4, and tabulated in Appendix A.

8.4.2 TPH in Pore Water

DRO were detected on three occasions in 2001 at concentrations up to 530 $\mu\text{g/L}$ (Table 8-4). DRO has not been detected at the other lysimeters. RRO has not been detected in any of the three lysimeters.

8.4.3 PCDD/PCDF in Pore Water

PCDD/PCDFs have been detected at concentrations ranging from 0.0006 pg/L to 22.5 pg/L TEQ (Table 8-4). Analytical results are provided in Appendix A.

8.5 Groundwater

Groundwater samples have been collected from the facility and analyzed since 1988 as part of the closed Wood Waste Landfill monitoring program, and since 1994 as a part of NPDES and SWDP requirements. As part of the SI, eight additional onsite groundwater monitoring wells (MW-10 through MW-17), and one offsite monitoring well (MW-18) was installed and sampled. A summary of analytes, number of samples and detection, range of concentrations, mean concentrations, and number of detections above the PRGs for site COPCs are presented in Table 8-5. Analytical results for all sampling events are provided in Appendix A.

Figures 8-8 and 8-9 show COPC concentrations for each groundwater monitoring well sampled in the fall of 2002 and July 2004, respectively.

8.5.1 Chlorinated Phenols in Groundwater

PCP has been consistently detected in three wells: MW-3, BXS-1, and MW-15. PCP concentrations in MW-3 have ranged from not-detected to 2,200 $\mu\text{g/L}$. PCP concentrations in BXS-1 have ranged from 5 $\mu\text{g/L}$ to 335 $\mu\text{g/L}$. Both MW-3 and BXS-1 are located hydraulically downgradient of the Main Treatment Area (Figures 8-8 and 8-9).

Of the wells installed in conjunction with the SI, PCP was detected in MW-13 (October 2002 at 19,000 $\mu\text{g/L}$) located within the Main Treatment Area, and MW-15 (290 to 790

$\mu\text{g/L}$), located northeast and hydraulically downgradient of the Main Treatment Area. MW-13 was only sampled once; sampling was discontinued once LNAPL was detected in the well. MW-12 also contains NAPL and has not been sampled since its installation in August 2002.

PCP concentrations in MW-2, located downgradient of the Treated Pole Storage Area range from not-detected to 9 $\mu\text{g/L}$; however, PCP has not been detected in MW-2 since a dedicated low-flow bladder pump was installed in 1999 to reduce sample turbidity, in accordance with EPA protocols.

PCP has been detected infrequently at low concentrations—in the following wells:

- MW-4 and BXS-4, located in the Untreated Pole Storage Area
- BXS-2 and BXS-3, on the western edge of the closed Wood Waste Landfill
- HCMW-6, in the Treated Pole Storage Area
- HCMW-5 and MW-1, upgradient of the Main Treatment Area
- HCMW-7, offsite and northwest of the Arlington facility
- MW-10, west of the Main Treatment Area
- MW-11, east of the Main Treatment Area
- MW-14, on the southern facility boundary
- MW-16 and MW-17, in the Northwest Parcel
- MW-18, offsite to the northwest of the facility.

No PCP has been detected in the three farthest downgradient monitoring wells (MW-16, MW-17, MW-18).

PCP concentrations in groundwater from samples collected in July 2002 (grab groundwater samples from temporary boreholes) and October 2002 (from monitoring wells) are presented in Figure 8-8. PCP concentrations for the July 2004 groundwater monitoring event are shown on Figure 8-9. A detailed summary of analytical results is provided in Appendix A.

8.5.2 TPH in Groundwater

DRO have been detected in 29 of 68 groundwater samples analyzed, at concentrations ranging from 54 $\mu\text{g/L}$ to 3,700 $\mu\text{g/L}$. The highest DRO concentration was in MW-13, located in the Main Treatment Area (Figure 8-8), where the presence of LNAPL has been observed. Maximum detected concentrations in MW-3 and MW-15, located downgradient of the Main Treatment Area are 770 $\mu\text{g/L}$ (MW-3; July 2003) and 320 $\mu\text{g/L}$ (MW-15; July 2004), respectively.

In other areas of the facility, only low or not-detected concentrations of DRO or other hydrocarbons have been sporadically detected at low concentrations. Gasoline-range hydrocarbons (TPH-G) and benzene, toluene, ethylbenzene, and xylenes were generally not detected in any groundwater samples. None of the SI wells have been analyzed for TPH-G.

DRO has not been detected in the three most hydraulically downgradient wells (MW-16 through MW-18). DRO concentrations in groundwater from samples collected in July 2002 (grab groundwater samples from temporary boreholes) and October 2002 (from monitoring wells) are presented in Figure 8-8. DRO concentrations for the July 2004 groundwater monitoring event are shown on Figure 8-9. A detailed summary of analytical results is provided in Appendix A.

8.5.3 PAHs in Groundwater

Total PAHs have been detected in 71 of 182 groundwater samples analyzed, at concentrations ranging from 0.013 $\mu\text{g/L}$ to 26.4 $\mu\text{g/L}$ (Table 8-5). The highest total PAH concentration was in MW-13, located in the Main Treatment Area (Figure 8-8), where the presence of LNAPL has been observed. Maximum detected total PAH concentrations in MW-3 and MW-15, located downgradient of the Main Treatment Area are 5.99 $\mu\text{g/L}$

(MW-3; July 2003) and 0.17 µg/L (MW-15; October 2002), respectively. In other areas of the facility, only low concentrations of total PAHs have been detected.

Total PAHs are present in the farthest downgradient wells at very low concentrations. The maximum total PAH concentrations detected at MW-16, MW-17, and MW-18 are 0.0085 µg/L (MW-16; October 2004), 0.0948 µg/L (MW-17; July 2004), and 0.013 µg/L (MW-18; October 2004), respectively. In other areas of the facility, only low concentrations of total PAHs have been sporadically detected. Total PAH concentrations in groundwater from samples collected in July 2002 (grab groundwater samples from temporary boreholes) and October 2002 (from monitoring wells) are presented in Figure 8-8. Total PAH concentrations for the July 2004 groundwater monitoring event are shown on Figure 8-9. A detailed summary of analytical results is provided in Appendix A.

8.5.4 PCDD/PCDFs in Groundwater

During previous investigations, groundwater samples, collected in October 1999, January 2000, and October 2000 from three wells (BXS-1, MW-3, and MW-2) (Figures 8-8 and 8-9) in which PCP has been regularly detected, were analyzed for PCDD/PCDFs. Wells were sampled in October 1999 using a bailer and in January 2000 using dedicated low-flow bladder pumps. In October 1999, PCDD/PCDFs were detected in MW-3 at 8.0 pg/L TEQ and in MW-2 at 887 pg/L TEQ. In January 2000, PCDD/PCDFs were detected at 0.0007 pg/L TEQ in MW-3 and at 1.7 pg/L TEQ in MW-2 (Appendix A).

Baxter installed dedicated low-flow bladder pumps in wells BXS-1, BXS-2, BXS-3, MW-2, MW-3, HCMW-5, and HCMW-6 in December 2000, and began using portable bladder pumps to sample the other wells. Since December 2000, PCDD/PCDF concentrations have been sporadically detected at concentrations up to 24.46 pg/L TEQ (MW-1; April 2002) in site wells. PCDD/PCDFs have never been detected in MW-10 or MW-15. A detailed summary of analytical results is provided in Appendix A.

8.5.5 Appendix IX Sampling

Groundwater samples from MW-3 and MW-10 were analyzed for a full suite of RCRA Appendix IX analytes in October 2002 and again in January 2003. Other than site-related COPCs (PCP and PAHs), the only other organic compound detected above reporting limits was xylene (up to 0.1 µg/L in MW-10). No aroclors, pesticides, or other organic analytes were detected. With respect to metals, only barium (6.3 µg/L to 8.4 µg/L) and zinc (2.1 µg/L to 2.9 µg/L) were detected in the two wells. Analytical data is provided in Appendix A.

8.5.6 Offsite Drinking Water Wells

As stated previously in Section 3, all functioning drinking water wells in the vicinity of the Arlington facility were sampled during four sampling events between June 2001 and January 2003. No PCP or TeCP were detected in any of the wells during the two-year period. The Drinking Water Well Sampling Report was submitted to EPA as Attachment 1 of the April 15, 2004, Progress Report (Baxter 2004a).

8.6 Air

8.6.1 Predictive Modeling

The ISCST3-PRIME model was used to estimate the annual average airborne concentration of each COPC for both the SCREEN3 and the Bellingham meteorological data sets. The model was run initially with the SCREEN3 meteorological conditions. Because SCREEN3 employs a generic worst-case matrix of meteorological conditions, the annual average concentration was assumed by applying a factor of 0.08 to the maximum 1-hour average result for each COPC. In order to obtain more realistic results, the model was run with a meteorological data set from the Bellingham, WA air station.

By observation of the results summarized in Appendix D, modeled concentrations for three COPCs exceeded their respective PRGs when using the SCREEN3, while none of the COPCs exceeded its PRG when using the Bellingham meteorological data set. PCP was selected to evaluate further because modeled PCP concentrations (using SCREEN3) exceeded the respective PRG at the eastern facility boundary, which are predominantly in non-residential areas.

As described in *Addendum A: Revised Air Quality Assessment* (Baxter 2003a), if any modeled COPC concentrations exceed 75% of their respective PRG, then a more refined analysis would be conducted. The refined analysis, referred to as the Tier II analysis in this report, included evaluating airborne COPC concentrations at specific locations (receptors) in the community around the Baxter facility. The specific receptors where COPC concentrations were evaluated include primarily street intersections relatively close to the facility. The receptors were between the facility and any residential area.

The Tier II analysis included any COPC that exhibited a modeled concentration greater than 75% of its respective PRG for either of the two meteorological data sets. As such, the COPCs included in the Tier II analysis included the following:

- PCP;
- benzo(a)anthracene;
- benzo(a)pyrene;
- benzo(b)fluoranthene;
- dibenzo(a,h)anthracene; and
- indeno(1,2,3-cd)pyrene.

The Tier II analysis was conducted in a similar manner to the original evaluation. COPC concentrations were evaluated by using the ISCST3-PRIME model to predict airborne COPC concentrations at each of the specific offsite receptor locations. The Tier II analysis resulted in no COPC concentrations exceeding their respective PRGs. A complete discussion of the methodology and results is provided in Appendix D.

8.6.2 Offsite Soil Sampling – Air Investigation

Offsite soil samples were also collected as part of the air investigation. Samples were collected at five offsite locations (SS120-SS124) shown on Figure 7-4. Low concentrations of PCP were detected in the five soil samples, ranging from 0.012 *J* (estimated concentration) mg/kg to 0.180 mg/kg (Table 8-6). The highest PCP concentrations were detected north of the facility at sample stations SS122 and SS123, at estimated concentrations of 0.100 mg/kg and 0.180 mg/kg, respectively.

PAHs were detected in all five offsite soil samples. Total PAH concentrations ranged from 0.0093 mg/kg to 1.1547 mg/kg (Table 8-6). The highest concentration was detected north of the facility at sample station SS123. Dioxins were also detected in all offsite soil samples. TEQs were calculated for all samples and ranged from 0.91 pg/g to 222.4 pg/g. The highest concentration was detected north of the Arlington facility (across 188th Street NE) at sample station SS123 (Table 8-6). Benzene and trimethylbenzenes were not detected in any of the offsite samples above the method detection limits.

8.7 Background Soil Sampling

Soil samples were collected from locations in the vicinity of the Arlington facility to establish background concentrations of COPCs. Twenty background sample locations (SS100 through SS119) and one duplicate sample were selected in the facility vicinity and are shown on Figure 7-4. At each location, one composite soil sample was analyzed

for chlorinated phenols, PAHs, TPH-D, and PCDD/PCDFs. Background soil data are summarized in Table 8-7, and presented in Appendix A. Sample locations are shown on Figure 7-4.

8.7.1 Chlorophenols in Background Soil

PCP was detected at five of the 20 background soil sample stations at concentrations ranging from 0.0028 mg/kg to 0.022 mg/kg. The sample with the highest PCP concentration was SS104, located approximately 750 feet north of the facility (Figure 7-4). No tetrachlorophenols, trichlorophenols, or dichlorophenols (DCP) were detected in the background samples.

8.7.2 TPH in Background Soil

DRO were detected in 19 of 20 stations at concentrations ranging from 5.3 mg/kg to 110 mg/kg. The highest concentration was observed at SS102, located approximately 2,000 feet north of the facility (Figure 7-4). RRO was detected in all of the samples, at concentrations ranging from 62 mg/kg to 690 mg/kg. The highest concentration was observed at SS105, located approximately 2,000 feet north of the facility (Figure 7-4).

8.7.3 PAHs in Background Soil

Low levels of PAHs were detected in most of the background samples. Total PAHs were highest at SS119, located approximately 1,200 feet southeast of the facility (Figure 7-4).

8.7.4 PCDD/PCDF in Background Soil

PCDD/PCDFs were detected in all of the background soil samples. TEQ concentrations ranged from 0.0967 pg/g to 36.63 pg/g. The highest concentration was observed at

SS109, located approximately one-mile west of the facility (Figure 7-4). Analytical results are provided in Appendix A, and summarized in Table 8-7.

9 Conceptual Site Model

This section presents the conceptual site model (CSM) for the Arlington facility based on a synthesis of the available physical and chemical data, and historical operations. The CSM presents a working hypothesis of the contaminant sources, distribution, and transport pathways.

A block diagram depicting the CSM is presented in Figure 9-1. The block diagram illustrates the current understanding of the potential sources and releases of COPCs, generalized hydrogeologic information, and COPC distribution and transport at the facility. The CSM block diagram is separated into three discrete blocks that generally relate to the Untreated Pole Storage Area, the Main Treatment Area, and Treated Pole Storage Area. As stated previously, these three operational areas were delineated for purposes of conducting the SI.

9.1 Chemicals of Potential Concern

Based on the operational history and previous investigations at the Arlington facility, the following COPCs have been identified:

- **Pentachlorophenol.** Petroleum hydrocarbon-based PCP solution is currently used at the facility to treat wood products. The PCP solution is primarily PCP dissolved in a carrier oil. The PCP solution also contains TeCP and TCP. Breakdown products of PCP include TeCP, TCP, DCP, pentachloroanisole, and other phenolic compounds. Contaminants in technical-grade PCP include PCDDs/PCDFs.

- **Petroleum hydrocarbons.** Petroleum hydrocarbon mixtures (generally referred to as TPH or DRO) such as diesel or other petroleum distillates have been used onsite as carriers for PCP and/or creosote. The carrier historically used for PCP treating solutions is medium aromatic oil with the physical characteristics similar to No. 2 diesel oil.
- **Polyaromatic Hydrocarbons (PAHs).** PAH compounds are the main components in creosote mixtures, and were historically used at the facility. Additional sources of PAHs may include the petroleum hydrocarbon-based carrier for creosote and PCP treating solutions.

9.2 PCP/Creosote Use and Source Areas

Three main areas have been designated for the Arlington facility for purposes of conducting the SI based on facility operations and the known and potential contaminant source areas at the facility. The three areas include the Main Treatment Area, the Treated Pole Storage Area and the Untreated Pole Storage Area (Figure 2-1), described in more detail below.

9.2.1 Main Treatment Area

The Main Treatment Area is where current and historical wood treating processes and chemical use has occurred. All currently-used treating equipment, including the two pressure retorts, the new butt tank, and the tank farms, are located within concrete secondary containment structures. No spills from these current operations have occurred, and annual inspection records at the facility indicate that these secondary containment structures remain in good structural condition.

Known or potential sources of releases to site media in the Main Treatment Area include the following:

- **The Old Butt Tank.** The Old Butt Tank lies southwest of the tank farm for the new butt tank (Figure 2-3). Although still in place, it has not been used since 1990. Overflows from the Old Butt Tank were reported to have occurred in March 1981 (1,400 gallons), February 1989 (200 gallons), and January 1990 (2,000 gallons).
- **The Old Thermal Tank.** The Old Thermal Tank was located to the south of the Old Butt Tank (Figure 2-3). Treating solution was transferred to this tank via an underground pipe from the storage tanks. Poles were treated in this tank with PCP treating solution.
- **The Old Thermal Retort.** The Old Thermal Retort was located to the north of the Old Butt Tank (Figure 2-3).
- **The Former Drip Area.** A drip pad was formerly located immediately south of Retorts 2 and 3 (Figure 2-3). Freshly treated poles removed from the pressure retorts were placed in this area until drippage of treating solution ceased. Treating solution may have been released to surface soils in this area between 1981 (when the retorts were constructed) and 1991 (when contained drip pads were constructed to the north of the retorts).
- **Butcher Pit.** During Butcher operations in the mid- to late 1960s, PCP and creosote wastes were reportedly disposed of in a 20-foot by 20-foot pit (EPA 1984; referred to as the "Butcher Pit"). The location of the pit is unknown. However, during expansion of the treatment system in the 1980s, Baxter excavated approximately 40 tons of a hard, heavy tar-like substance in the area just west of the kilns (Figure 2-3). The material was transported and landfilled at

Chemical Waste Management's Arlington, Oregon landfill (Crane, pers. comm. 2001). No information is available on the composition of the tar-like substance.

- **The Septic Tank.** The septic tank is located at the west end of the former Old Thermal Retort (Figure 2-3). Creosote and PCP treating solution were observed in the septic tank during removal of the Old Thermal Retort in 1975.

9.2.2 Treated Pole Storage Area

The Treated Pole Storage Area surrounds the Main Treatment Area and is used to store treated poles (Figure 2-3). Known historical or potential sources of releases to site-media in the Treated Pole Storage Area include:

- **Treated Poles.** Treated poles are placed in piles on skids that are separated by access roads. *De minimus* drippage may occur from treated poles, but soil stained with drippage is collected and disposed of in accordance with Subpart W and Baxter's *Incidental and Infrequent Drippage Plan*.
- **Spill Accumulation Area.** In 1990, a 2,000 gallon spill from the Old Butt Tank accumulated in a depression near former catch basin CB25.
- **Ditches, Former Catch Basins, and Overland Flow.** The ditches, former catch basins, and overland flow in the Treated Pole Storage Area were potential sources of COPCs to the subsurface via infiltration of affected stormwater.

9.2.3 Untreated Pole Storage Area

- The Untreated Pole Storage Area and is used to store untreated poles (Figure 2-2). No site-related chemicals are used in this portion of the facility.

9.2.4 Potential Air Emissions Sources

Potential emission sources include wood treating operations in the retorts and butt tank, storage and handling of wood treating solutions, recycling of wood treating chemicals, treated water recycling and cooling tower operation, and fugitive emissions from process piping.

9.3 *Transport Pathways and Potential Receptors*

Potential pathways for COPC transport to human or ecological receptors include direct contact with soil, groundwater, NAPL, stormwater, and air transport. Of these, groundwater and NAPL as well as stormwater and sediment transport are the primary pathways of interest because of the ongoing potential for effects on human or ecological receptors. Because of the interrelationship between NAPL transport and groundwater transport, these pathways are discussed collectively. Similarly, the stormwater pathway and sediment pathway are also discussed collectively in the following sections. Other remaining potential pathways are addressed at the end of this section.

The potential exposure pathways and receptors are depicted on Figure 9-2. These pathways and receptors should be considered preliminary, and will be evaluated in more detail during the risk assessment.

9.3.1 Groundwater and NAPL Pathways

The groundwater and NAPL pathways involve the movement of a COPC (such as PCP or creosote treating solution constituents) in groundwater to potential downgradient receptors. To be considered a complete pathway, the COPC must be incorporated into groundwater in a dissolved (aqueous) phase, sorbed onto particulate or colloidal particles, or as NAPL, and must be transported to a point of contact with the end receptor (human

or ecological). At the Arlington facility, groundwater transport of COPCs may occur by the following mechanisms:

- Leaching of COPC-affected soils or sediments in the vadose (unsaturated) zone and infiltration of the leachate to groundwater.
- Direct contact of COPC-affected soils with groundwater.
- Direct contact of NAPL (containing COPCs) with groundwater.

Historically, all these processes may have occurred at one time or another at the facility. For example, over the period of facility operations, gravity and the infiltration and percolation of rainfall in the Main Treatment Area and Treated Pole Storage Area may have carried the PCP or creosote treating solutions (as a NAPL or as a dissolved phase) downward vertically through the unsaturated soil zone to the unconfined shallow groundwater surface. If NAPL migrated downward, a small amount of residual NAPL may have been trapped in vadose zone soils by capillary forces. NAPL can occur as LNAPL, which has a density less than water, or DNAPL, which has a density greater than water.

If sufficient LNAPL (e.g., PCP treating solution) is present above the water table, it could migrate following the gradient of the water table. When the water table rises or falls in response to seasonal fluctuations, residual LNAPL could be trapped above and below the water table. NAPL (either LNAPL or DNAPL) present in sufficient quantities can migrate laterally and potentially flow into recovery wells (i.e., mobile NAPL).

Once a NAPL pathway to groundwater is established, a groundwater plume will develop. Mobile and residual NAPL, if present in contact with groundwater, would be a long-term source of COPCs to groundwater at the facility.

9.3.2 Stormwater and Sediment Pathways

The stormwater and sediment pathways address the potential particulate or dissolved-phase transport of COPCs at or from the facility. To be considered a complete pathway, the COPC-containing soil, groundwater, or NAPL must come into contact with stormwater and must be physically or chemically transported into the stormwater at the facility. Transport of COPCs by stormwater and sediments has been documented at the facility. In addition, the infiltration of COPC-affected stormwater into vadose zone soils and groundwater is a potential pathway. Offsite transport of COPCs by this pathway is unlikely as all stormwater is contained and treated at the facility.

9.3.3 Air Transport Pathways

The potential pathways for emissions from wood treating operations at the Arlington facility include the following:

- Potential direct exposure to airborne vapors and contaminated windblown dust, potentially affecting offsite receptors, including workers at adjacent industrial operations and nearby residents. However, the windblown dust pathways appear to be incomplete due to Baxter's dust control measures conduct at the facility.
- Potential deposition of vapors onto the ground, where PCP could accumulate in surface soils and where direct contact could then occur or the chemicals could then migrate from surface soil into surface water or groundwater.
- Inhalation exposure by onsite workers. Measurements collected at the Arlington facility during a previous investigation demonstrated that the maximum worker exposure is only a small fraction of the allowable OSHA workplace limits. Therefore, it is concluded that this exposure pathway is not significant.

9.3.4 Other Transport Pathways

Other potential pathways at the facility include direct contact with COPC-affected media. COPC-affected media may potentially include soil, sediment in ditches, and stormwater.

9.3.5 Potential Receptors

Potential current and future human receptors include primarily onsite plant workers. Onsite workers are likely to be the receptor population with the highest exposure potential. Onsite and offsite workers, residents, and trespassers could potentially contact COPCs in site media via ingestion, dermal contact, or, to a lesser extent, inhalation. However, the pathways for these potential receptors does not appear to be complete.

10 Summary of Findings

This section summarizes the findings of the SI and other investigations conducted at the Arlington facility by area. The discussion presented in this section does not include a detailed evaluation of SI data against potentially applicable criteria. These tasks will be conducted as part of the risk assessment.

10.1 Main Treatment Area

10.1.1 Surface Soil

Results of previous investigations and the SI have indicated the presence of COPCs in surface soil in the Main Treatment Area. The one pre-SI surface soil sample station (SS-1) (Figure 3-1) located in the Main Treatment Area contained a PCP concentration of 6.0 mg/kg and a PCDD/PCDF concentration of 5,734 pg/g TEQ in the 2-inch depth interval. PCP was detected at this same sample station in the 8-inch depth interval at a concentration of 0.15 mg/kg.

One surface soil sample was collected from the Main Treatment Area during the SI. Sample SS-24 was collected from just east of the pressure retorts (Figure 8-1). Concentrations of PCP (0.23 mg/kg), DRO (35 mg/kg), and PCDD/PCDFs (494 pg/g TEQ) were detected in the 0- to 2-inch interval. Concentrations of PCP (0.56 mg/kg), DRO (73 mg/kg), and total PAHs (0.15 mg/kg) were also detected in the 6- to 18-inch interval.

10.1.2 Subsurface Soil

Results of previous investigations and the SI have indicated the presence of COPCs in subsurface soils in much of the Main Treatment Area. In general, soil samples collected and analyzed from borings drilled adjacent to the Old Butt Tank, where several spills have been reported, contained the highest concentrations of COPCs in subsurface soils in the Main Treatment Area during previous investigations.

Residual NAPL was observed during the installation of many of the pre-SI soil borings as well as several installed during the SI. All of the borings in which residual NAPL was observed are located within the Main Treatment Area. Residual NAPL in these borings was observed at depths ranging from 10 to 42 feet bgs. LNAPL has been observed in two monitoring wells (MW-12 and MW-13) installed in this area.

During the SI, two borings (SB-41 and SB-42) were installed to depths of approximately 42 and 43 feet bgs, respectively, to investigate the possible presence of COPCs south and west of the retorts (Figure 6-2). Very low or non-detectable concentrations of COPCs were observed in the samples from these two borings (Figures 8-3 through 8-6).

Borings MW-10 and MW-11 were installed west and east of the Main Treatment Area, respectively, to investigate groundwater at these locations (Figure 7-3). During the installation of these well borings, soil samples were collected and analyzed at a maximum sample depth of 31 feet bgs. Very low or non-detectable concentrations of COPCs were observed in these borings (Figures 8-3 through 8-6).

Five shallow soil borings (SB-47 through SB-51) were installed in the area where a treatment solution spill from the Old Butt Tank reportedly accumulated in 1990 (Figure 2-3). The purpose of these borings was to determine if this area warrants further investigation. One soil sample vertically composited from the 4 to 6 feet bgs interval for

each boring was analyzed for chlorinated phenols, PAHs, and TPH-D. Low or non-detectable concentrations of COPCs were observed in these samples.

10.1.3 Groundwater

During previous investigations, wells MW-1 and MW-3 were installed in the Main Treatment Area. During the SI, wells MW-10 through MW-13 were installed in the vicinity of the Main Treatment Area. LNAPL has been observed in wells MW-12 and MW-13 at thicknesses up to 5.57 feet.

Of all Arlington facility groundwater wells, the highest concentrations of COPCs were observed in well MW-13 located near the Old Butt Tank (Figure 7-4). However, this well has only been sampled on one occasion (October 2002) due to the presence of LNAPL. Of the remaining Arlington facility wells, the highest concentrations of COPCs have been generally observed in MW-3 located hydraulically downgradient (northwest) of the Main Treatment Area. Since initiation of the SI in 2002, the highest concentration of PCP in facility wells has been observed in MW-3 (2,200 µg/L; October 2004). The highest concentration of total PAHs has also been observed in MW-3 (5.997 µg/L; July 2003).

10.2 Treated Pole Storage Area

10.2.1 Surface Soil

PCP and PCDD/PCDFs have been detected in surface soils during previous investigations in the Treated Pole Storage Area. PCP concentrations in pre-SI surface soil samples range between 5.3 mg/kg and 90 mg/kg, and PCDD/PCDF concentrations range between 4,700 pg/kg and 6,400 pg/g TEQ. PCP concentrations in slightly deeper pre-SI samples (0.8 feet) at the same locations were much lower, ranging between 0.096 mg/kg and 16 mg/kg.

Fourteen surface soil sample stations were collected from this area during the SI. At each location, soil samples were collected from the 0- to 2-inch depth interval and from the 6- to 18-inch depth interval and analyzed for chlorinated phenols and TPH-D. At seven locations, the 6- to 18-inch depth interval was also analyzed for PAHs. Three of these samples from the 0- to 2-inch interval were also analyzed for PCDD/PCDF.

PCP concentrations detected during the SI ranged from 0.1 mg/kg to 10.0 mg/kg in the 0- to 2-inch depth interval. PCP concentrations in the 6- to 18-inch SI surface samples ranged from 0.018 mg/kg to 2.0 mg/kg. Total PAH concentrations in the 6- to 18-inch SI surface samples ranged from 0.0086 mg/kg to 0.19577 mg/kg. PCDD/PCDF concentrations ranged from 87 pg/g TEQ to 645 pg/g TEQ. Surface soil data from the SI are shown on Figures 8-1 and 8-2.

Concentrations of COPCs collected from a random grid during the SI are generally lower than pre-SI surface soil samples. With the exception of the PCDD/PCDFs results, most samples are below the respective PRGs for industrial sites.

10.2.2 Subsurface Soil

PCP and PCDD/PCDFs have been detected in surface soils collected in the Treated Pole Storage Area during previous investigations. Pre-SI PCP concentrations range between 5.3 mg/kg and 90 mg/kg, and PCDD/PCDF concentrations range between 0.0047 pg/g and 0.0064 pg/g TEQ. PCP concentrations in slightly deeper samples (0.8 feet) at the same locations were lower, ranging between 0.096 mg/kg and 16 mg/kg.

No subsurface soil samples were collected in the Treated Pole Storage Area during the SI.

10.2.3 Groundwater

Two wells (HCMW-6 and MW-2) are considered to be associated with the Treated Pole Storage Area (Figure 7-3). PCP, DRO and PAH concentrations in HCMW-6 have either been very low or below detection limits since Baxter began using the low-flow bladder pumps, to reduce sample turbidity in accordance with EPA protocols. PCDD/PCDFs have only been detected once in HCMW-6 (23 pg/L: April 2002). Since initiation of the SI, PCP, DRO and PAH concentrations in MW-2 have also either been very low (below applicable PRGs) or below detection limits. PCDD/PCDFs have been detected at low concentrations in MW-2 over the last few years.

10.3 Untreated Pole Storage Area

10.3.1 Surface Soil

Prior to the SI, no surface soil samples had been collected in the Untreated Pole Storage Area. Eleven surface soil sample stations were located in this area during the SI (Figure 8-1). At each location, soil samples were collected from the 0- to 2-inch depth interval and from the 6- to 18-inch depth interval. With the exception of samples collected at stations SS18B and SS18C which were only analyzed for PAHs, each sample was analyzed for chlorinated phenols and TPH-D. At five locations, the 6- to 18-inch depth interval was also analyzed for PAHs. Two samples were also analyzed for PCDD/PCDF.

PCP concentrations in the 0- to 2-inch SI surface samples ranged from 0.047 mg/kg to 0.99 mg/kg. PCP concentrations in the 6- to 18-inch depth samples ranged from 0.0041 mg/kg to 0.130 mg/kg. Total PAH concentrations in the 6- to 18-inch depth ranged from 0.00362 mg/kg to 1.04399 mg/kg. PCDD/PCDF concentrations in SS16 and

SS21 (0- to 2-inch interval) were 109 pg/g and 116 pg/g TEQ, respectively. Surface soil data from the SI are shown on Figure 8-1 and Figure 8-2.

With the exception of PCDD/PCDFs, and several PAH compounds at SS-18A, all other COPCs in the Untreated Pole Storage Area are below the applicable PRGs.

10.3.2 Subsurface Soil

Seven soil borings (SB-52 through SB-58) were installed adjacent to selected Untreated Pole Storage Area catch basins to evaluate the potential for stormwater in this area to be a source of COPCs to soil and groundwater. The borings were completed to depths ranging from 29 to 36 feet bgs. Two soil samples from each boring were analyzed for chlorinated phenols and TPH-D. The first sample from each boring was collected from depths ranging from 4 to 8 feet bgs. The second sample from each boring was collected from a depth determined to be approximately halfway to the water table. The second sample collection depths ranged from 12 to 26 feet bgs depending on the depth to groundwater at each boring location. PCP was detected in the shallow samples from these borings at three locations (SB-52 at 0.140 mg/kg, SB-56 at 0.0062 mg/kg, and SB-58 at 0.074 mg/kg). PCP was detected only one of the deeper samples from these borings (SB-58 at 28 mg/kg). TPH-D was detected in samples from these borings

Three soil borings (SB-59, SB-60, and MW-14) were installed near the southern facility boundary to evaluate the potential for stormwater and overland flow to be a potential source of COPCs to shallow soils (Figures 7-2 and 7-3). One sample was collected from each boring from the 4- to 6-foot interval and analyzed for chlorinated phenols, PAHs, and TPH-D. PCP was not detected in the three samples. TPH-D was detected in the samples from MW-14 and SB-60 at concentrations of 15 and 4.9 mg/kg, respectively. PAHs were detected in all three samples at low concentrations (total PAHs up to 0.00509 mg/kg). TPH-D was detected only in the sample from SB-60 at an estimated

concentration of 4.9 mg/kg. Subsurface soil data from the SI are shown on Figures 8-3 through 8-6.

No subsurface soil samples collected in the Untreated Pole Storage Area contained concentrations of COPCs exceeding PRGs.

10.3.3 Groundwater

Two groundwater wells (MW-4 and BXS-4) were installed during previous investigations in the Untreated Pole Storage Area. COPCs have been detected infrequently at low concentrations—the highest PCP concentration detected was 1.3 $\mu\text{g/L}$ at BXS-4 in 1991.

During the SI, MW-14 was installed on the southern facility boundary. PCP has not been detected in MW-14, and PAHs have been observed only at low concentrations (total PAHs up to 0.0339 $\mu\text{g/L}$). Groundwater data from the SI are shown on Figures 8-7 and Figure 8-8.

Since initiation of the SI, concentrations of COPCs in wells BXS-4 and MW-14 have not exceeded the PRGs.

10.4 Other Areas

10.4.1 Penta Storage Shed

One surface soil sample collected from the 0- to 6-inch depth interval (SS25) contained a concentration of PCP of 1.9 mg/kg, which is below the PRG for industrial soil (Figure 8-1).

10.4.2 Northwest Parcel and Offsite Groundwater

Well HCMW-7 was installed north of the Northwest Parcel during a previous investigation. Three wells (MW-15 through MW-17) were installed in this area during the SI. COPCs have been detected in MW-15, with concentrations of PCP up to 790 $\mu\text{g/L}$, DRO up to 320 $\mu\text{g/L}$, and total PAHs up to 0.1731 $\mu\text{g/L}$.

PCP and DRO have not been detected in MW-16 or MW-17, which are downgradient of MW-15 and near the property boundary. PAHs have been observed at low concentrations in these two wells (total PAH up to 0.0948 $\mu\text{g/L}$), but no individual PAH compound was detected at concentrations exceeding respective PRGs for tap water. Well MW-18 was installed during the SI offsite across 188th Street NE in the hydraulically downgradient direction (northwest) from the Main Treatment Area (Figure 8-9). No PCP or TPH-D has been observed in this well. A few individual PAHs have been detected in MW-18 at concentrations well below the respective PRGs for tap water. The highest total PAH concentration in MW-18 was 0.013 $\mu\text{g/L}$. Groundwater data from the SI are shown on Figure 8-8 and Figure 8-9.

All functioning drinking water wells in the vicinity of the Arlington facility were sampled during four sampling events between June 2001 and January 2003. No PCP or TeCP were detected in any of the wells during the two-year period.

10.4.3 Potential Air Emissions

COPC concentrations were evaluated by using the ISCST3-PRIME model to predict airborne COPC concentrations at specific locations in the vicinity of the Arlington facility. A Tier II analysis resulted in no modeled COPC concentrations in exceedance of respective PRGs.

Five offsite soil samples were also collected as part of the air investigation. Low concentrations of PCP and PAHs were detected in the offsite soil samples. PCDD/PCDFs

were also detected in all offsite soil samples at concentrations ranging from 0.915 pg/g to 222.4 pg/g.

10.4.4 Background Soil Samples

Twenty stations were sampled in the vicinity of the Arlington facility to establish background concentrations of COPCs. PCP was detected at five of the 20 offsite soil sample stations, at concentrations ranging from 0.0028 mg/kg to 0.022 mg/kg.

DRO was detected at 19 of 20 stations, at concentrations ranging from 5.3 mg/kg to 110 mg/kg. Low levels of PAHs were detected in most of the offsite samples. TEQ concentrations ranged from 0.0967 pg/g TEQ to 36.63 pg/g TEQ. The highest concentration was observed approximately one-mile west of the facility.

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Figures

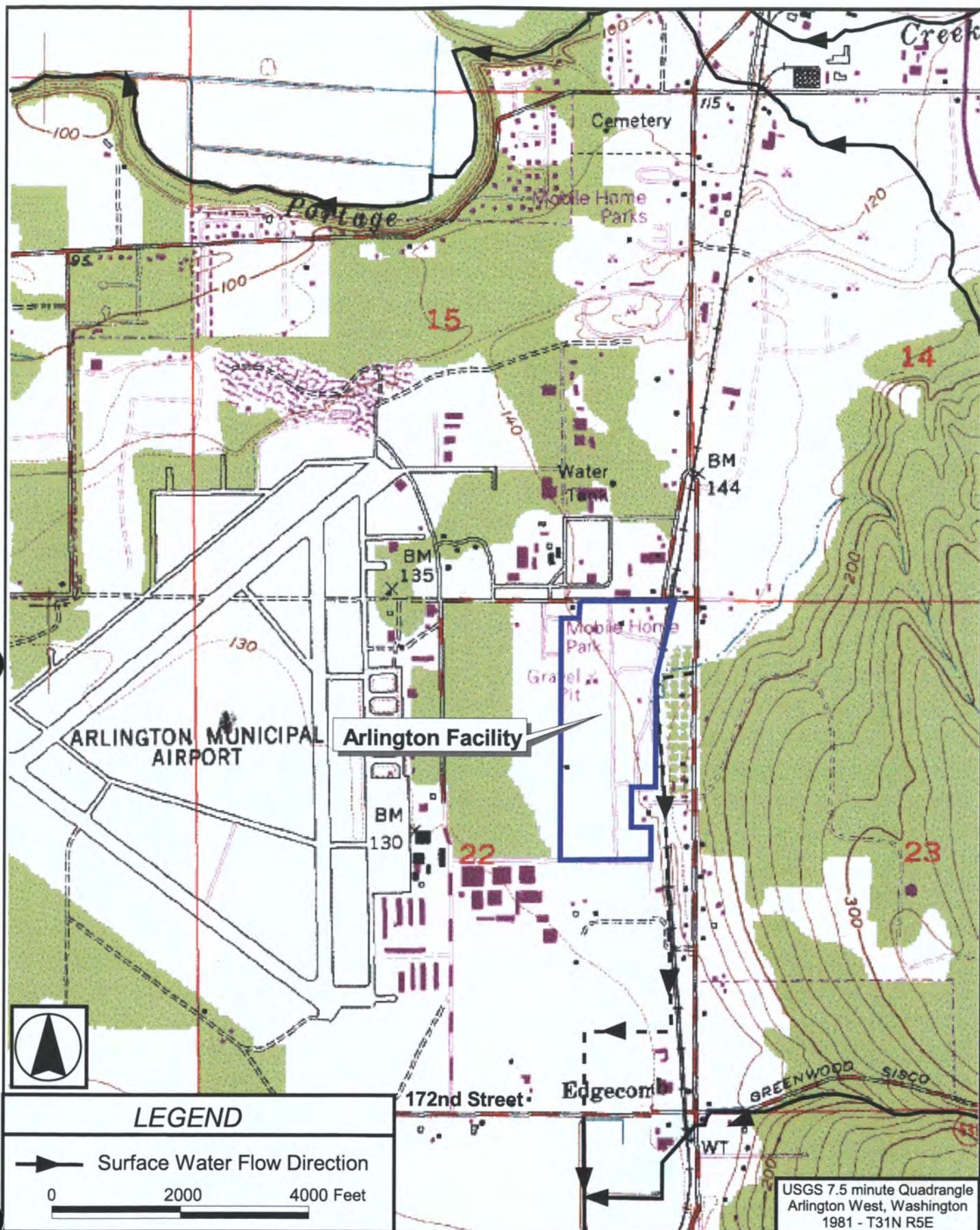


Figure 1-1. Site Vicinity Map - J.H. Baxter & Co. - Arlington, WA

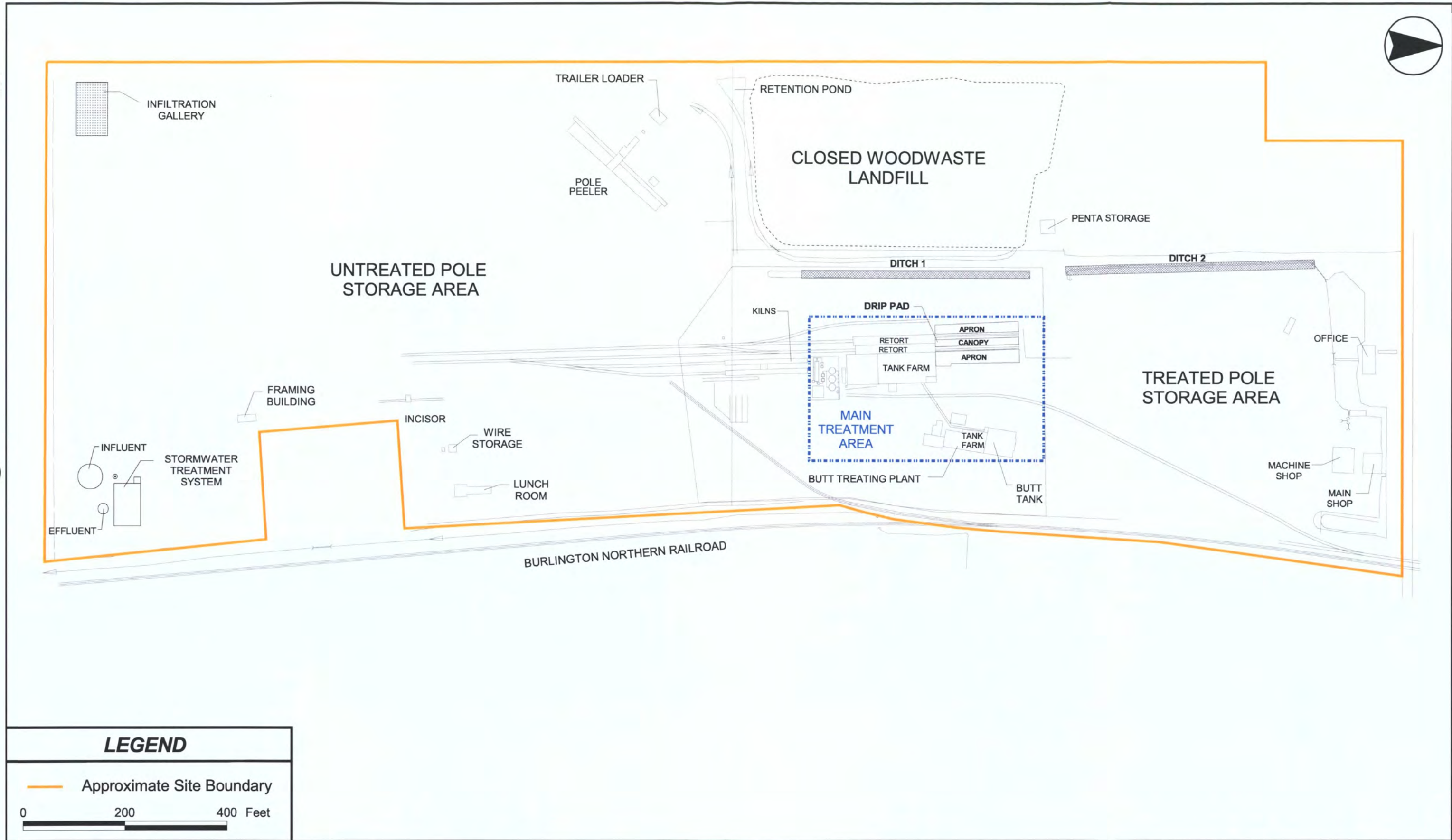
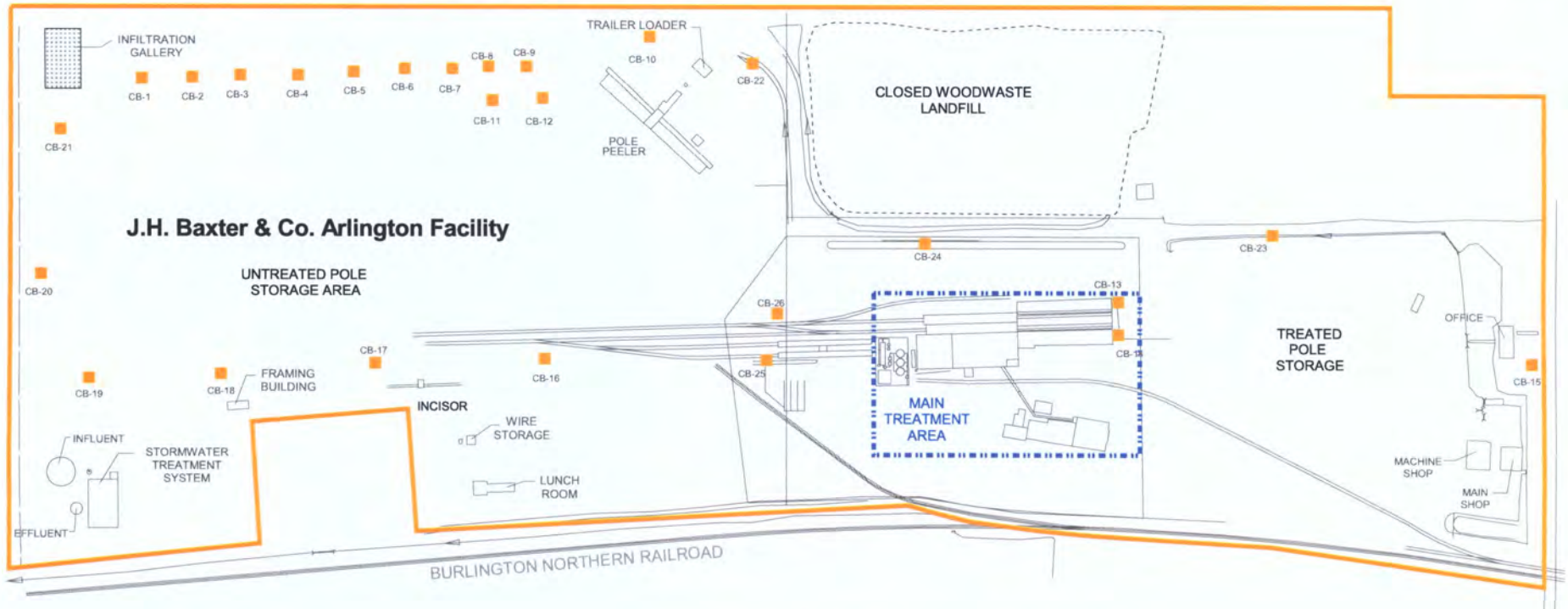


Figure 2-1. Site Plan - J.H. Baxter & Co. - Arlington, WA



LEGEND

- Catch Basin
- Approximate Site Boundary

0 200 400 Feet

Figure 2-2. Catch Basins

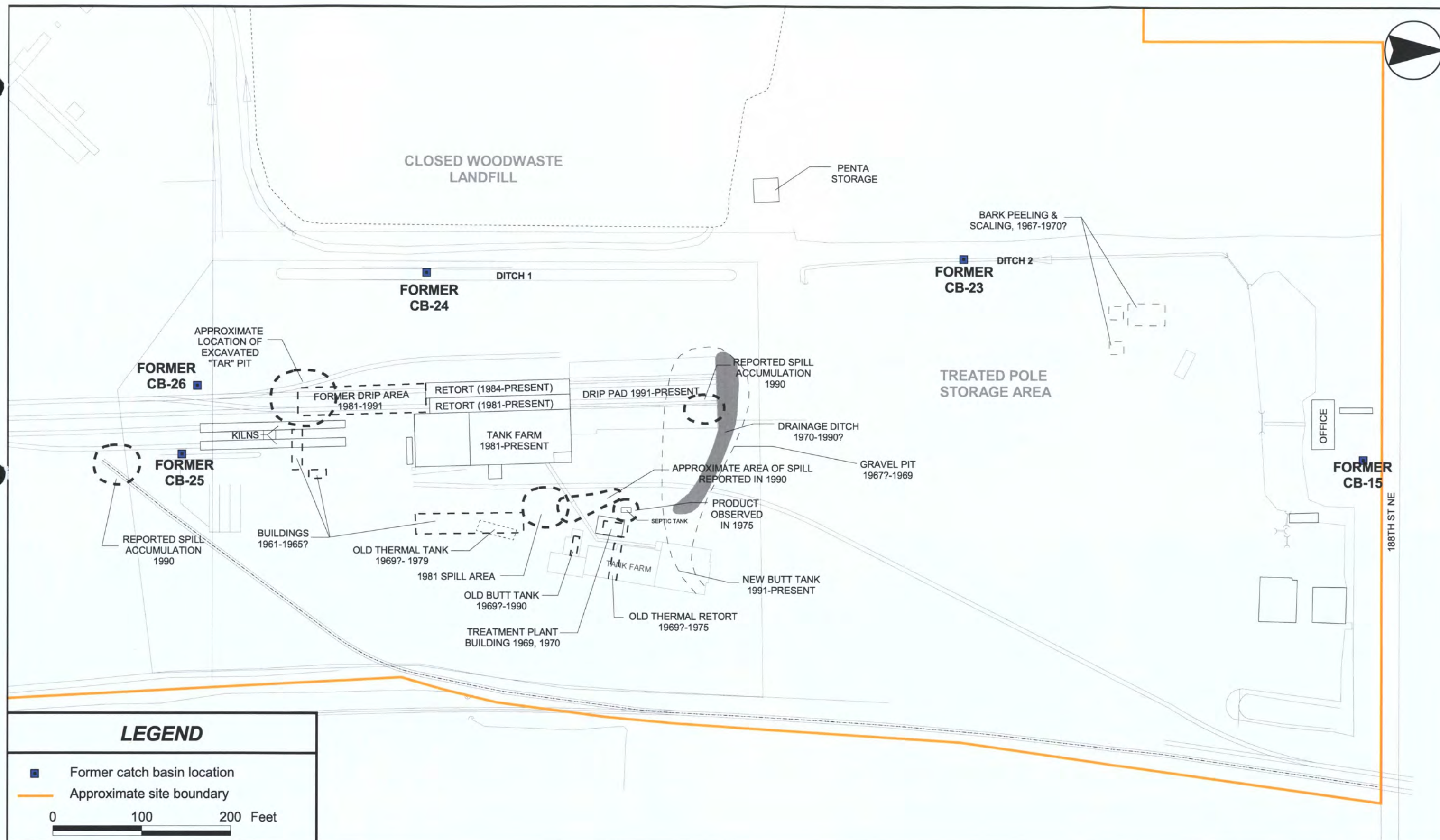


Figure 2-3. Historical Features and Spill Locations

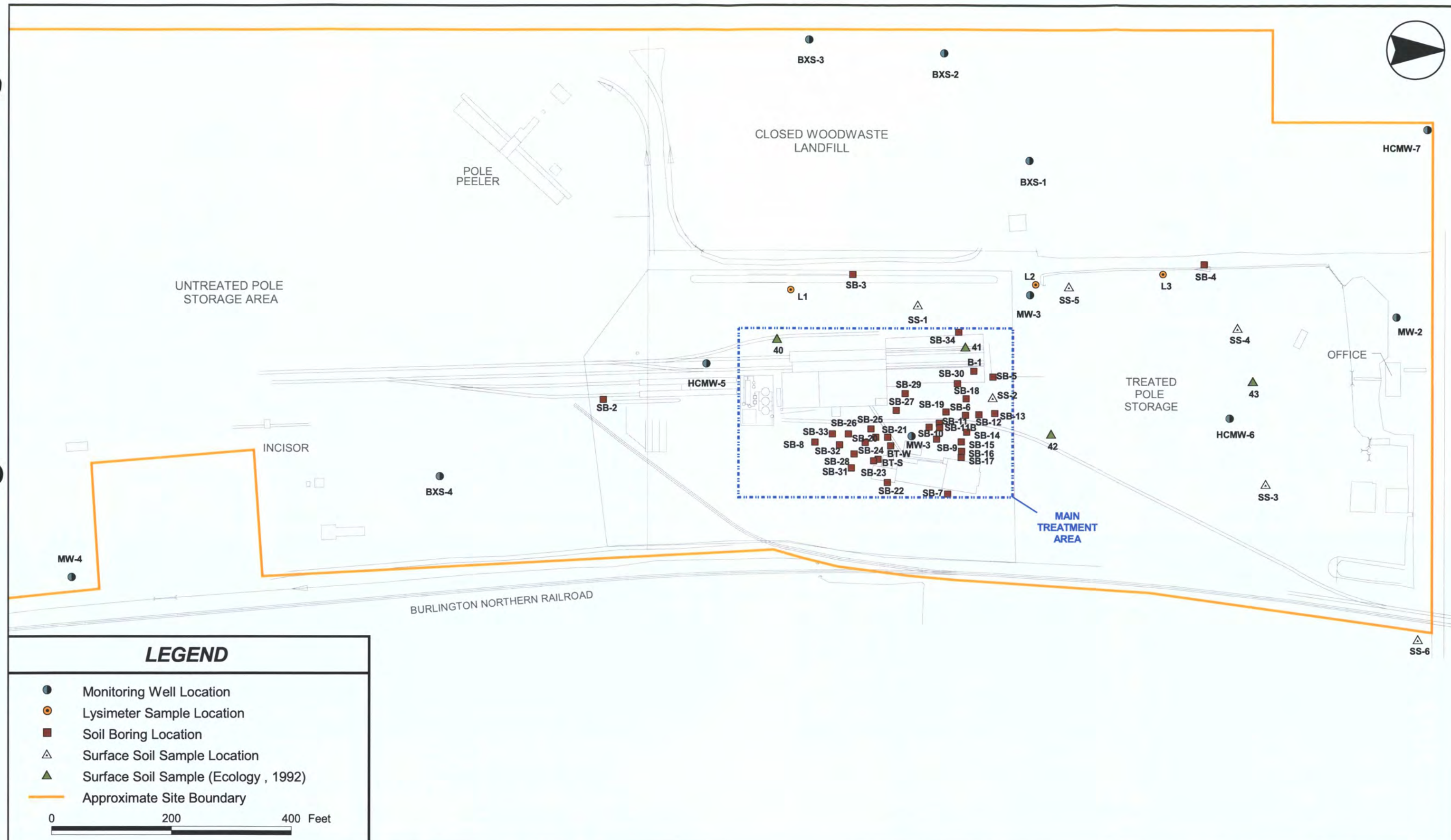
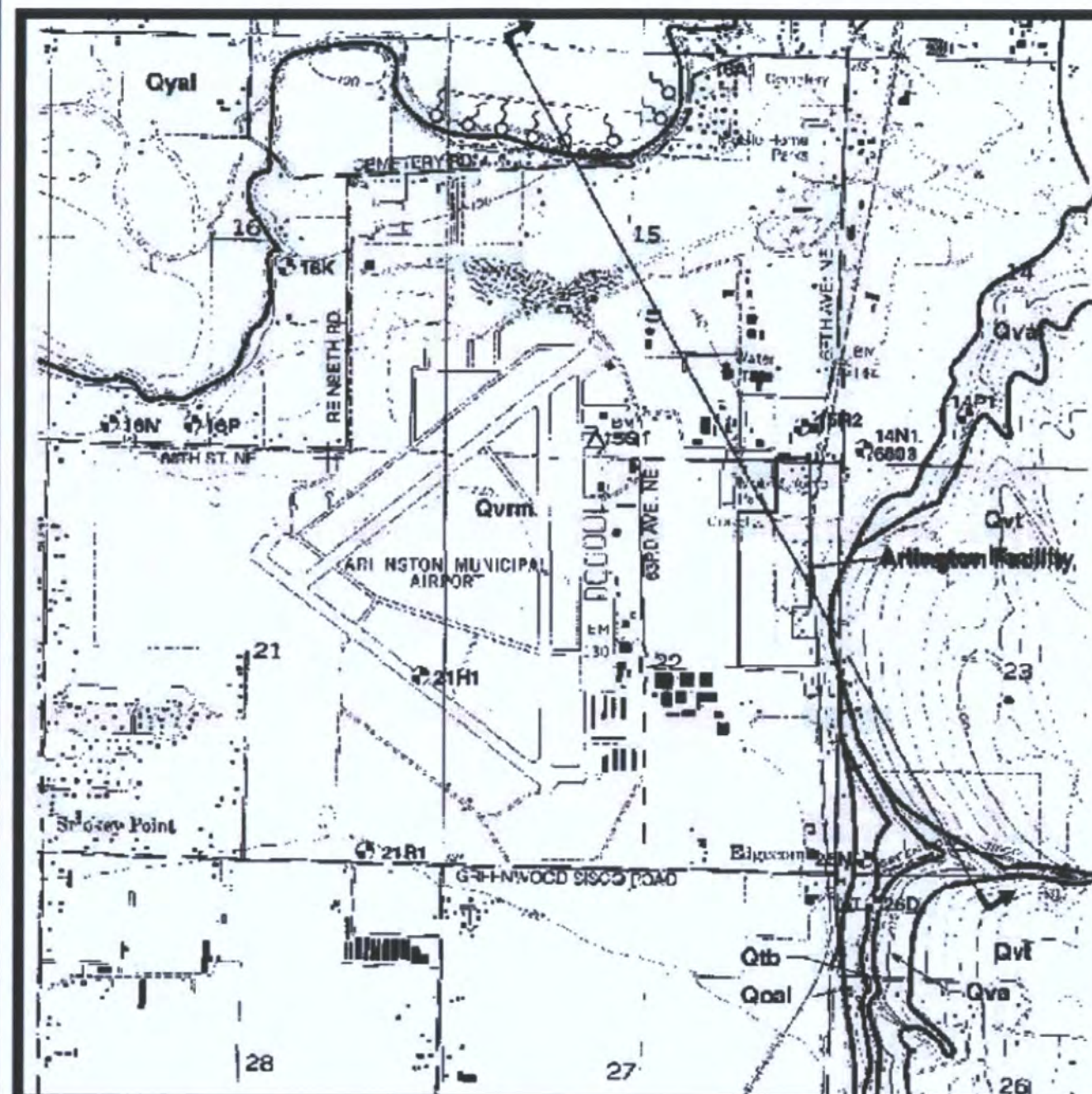
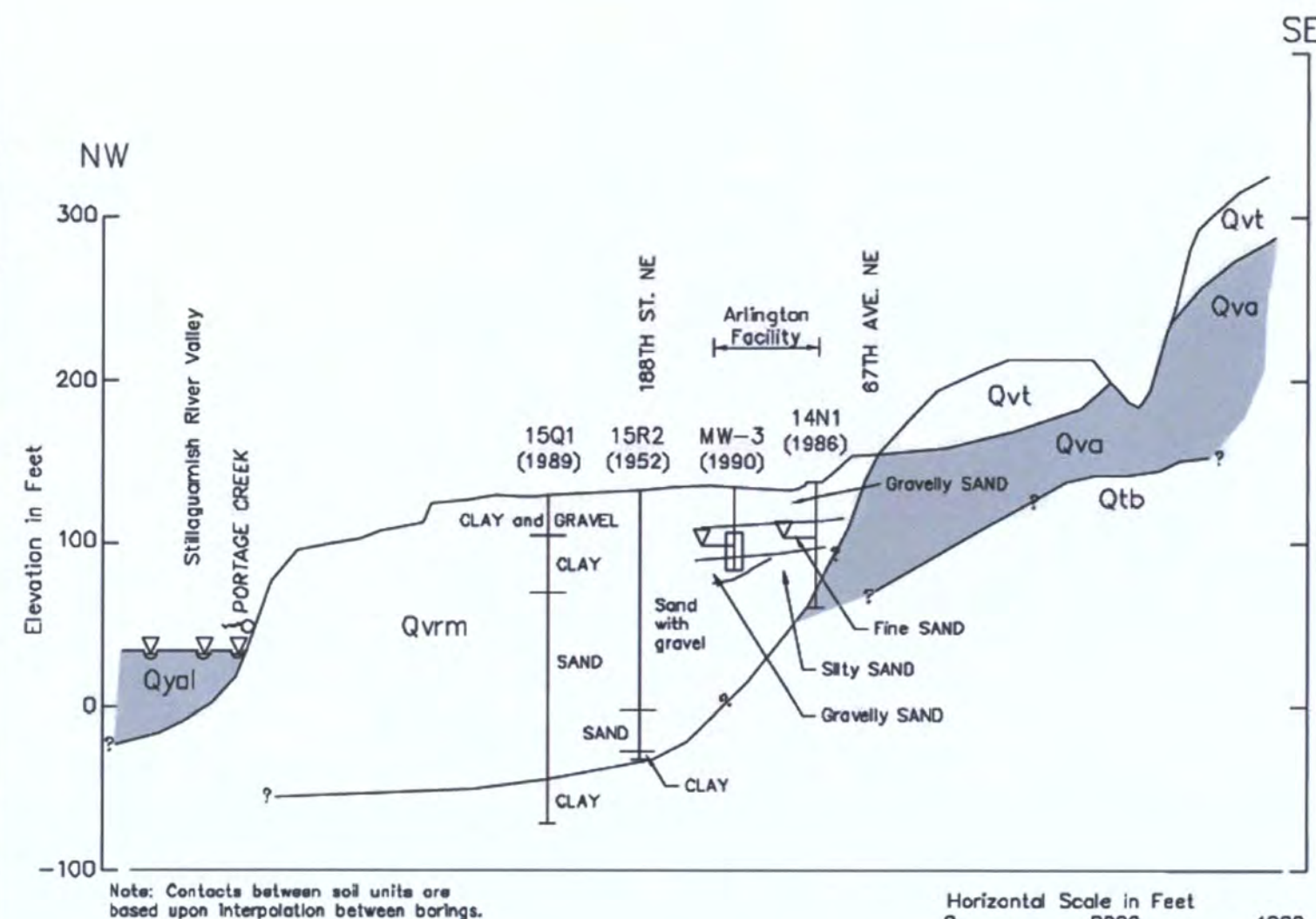


Figure 3-1. Historic Sample Stations (Pre-Site Investigation)



- 16A1 Well Log Available from Dept. of Ecology or Newcomb (1952)
- △ 15Q1 Ecology Log for Anode Well



15R2 (1952) Exploration Number (Date of Log or Data Source)

- Exploration Location
- Water Level
- Screened Interval (When available)
- Seep

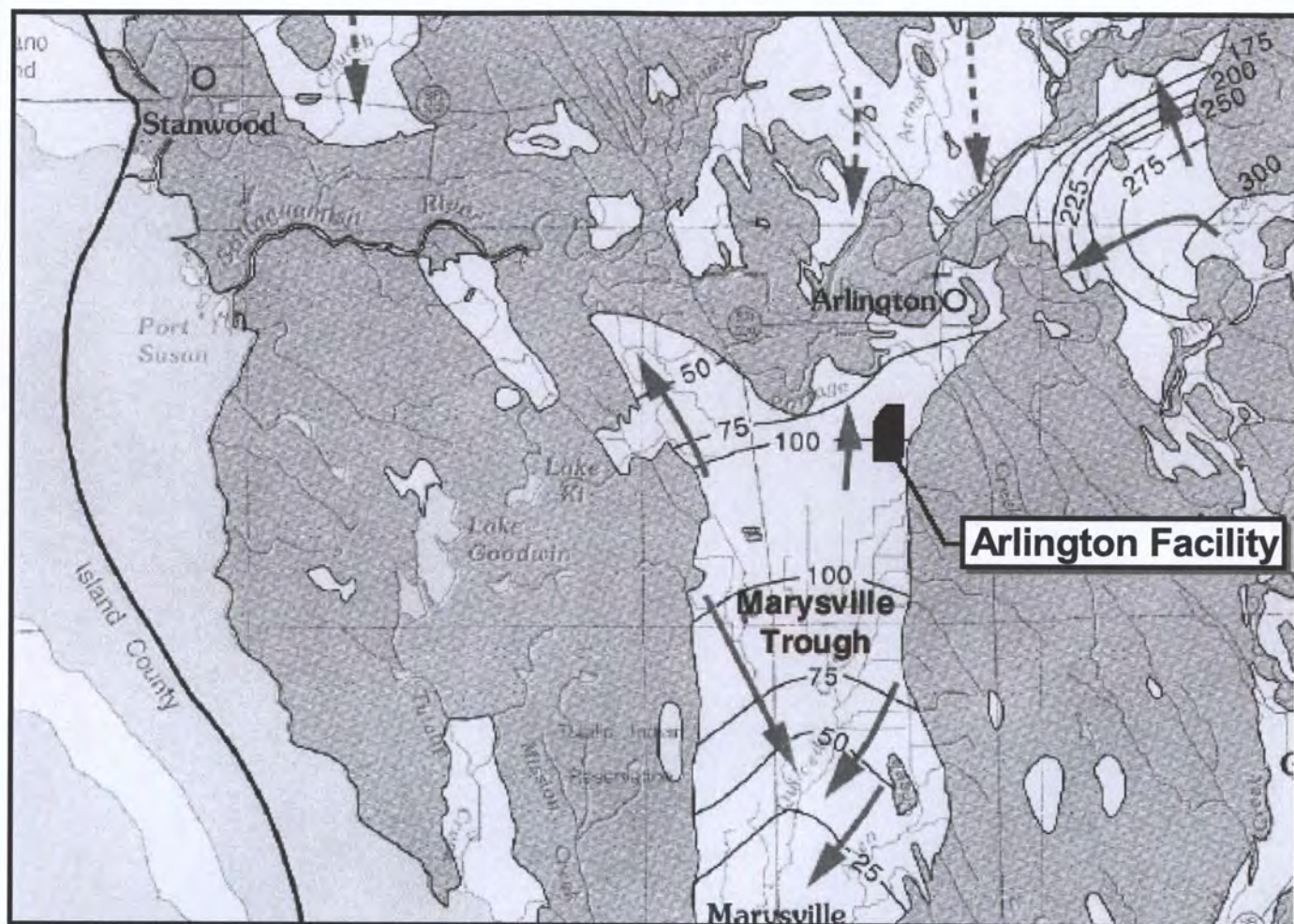
Geologic Units from Minard (1985)

- Qyal Younger Alluvium
- Qvrm Recessional Outwash - Marysville Member
- Qvt Till
- Qva Advance Outwash
- Qtb Transitional Beds Silt

Horizontal Scale in Feet
0 2000 4000

Vertical Scale in Feet
0 100 200
Vertical Exaggeration x 20

Figure 5-1. Regional Geology Map and Cross Section



Note:

Map created by base map by B.E. Thomas, J.M. Wilkinson, and S.S. Embrey, entitled "Plate 6. Areal Recharge From Precipitation and Potentiometric Surfaces of Principal Aquifers, Western Snohomish County, Washington," dated 1997

0 4 8 Miles

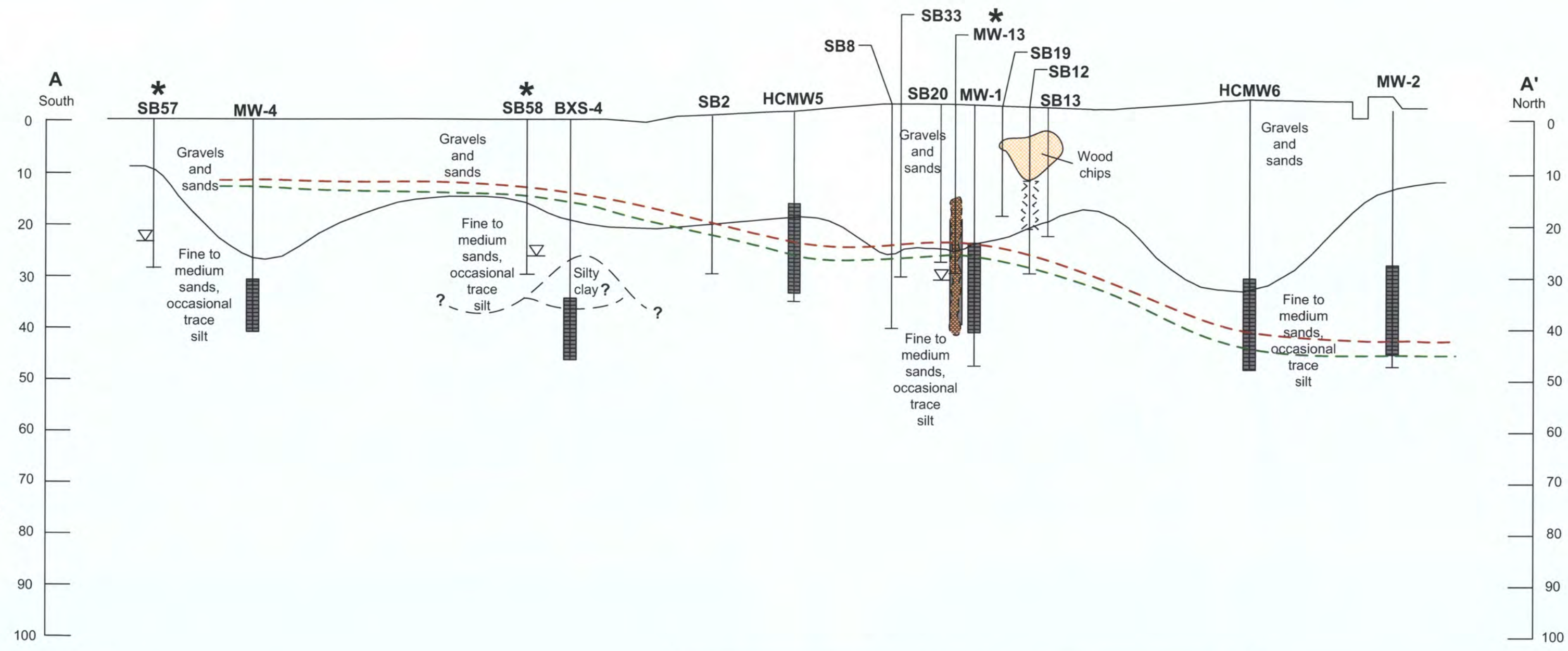
LEGEND

- 50 Groundwater Elevation
- Groundwater Elevation Contour
- Inferred Groundwater Flow Direction

Figure 5-2. Regional Groundwater Flow Directions

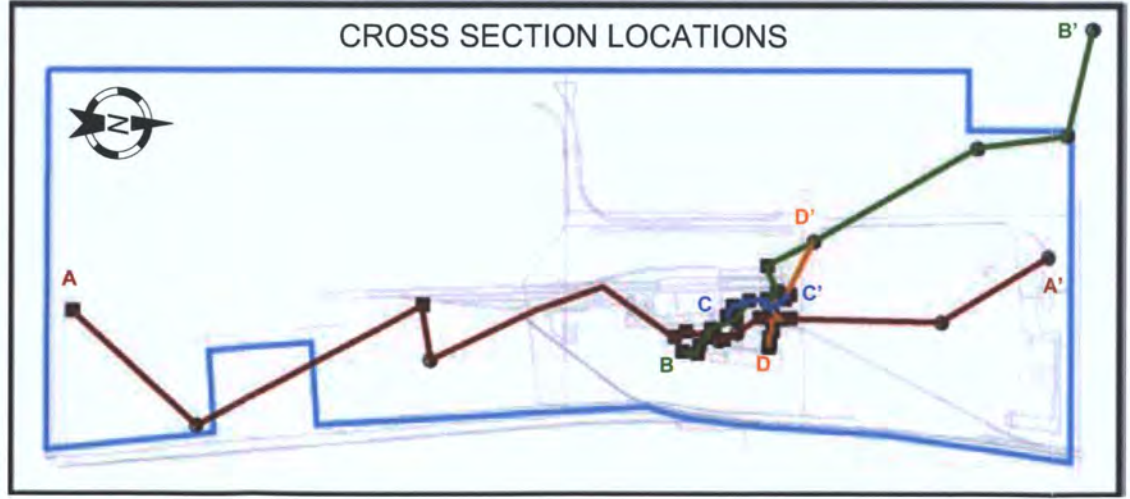
PREMIER

axter



LEGEND

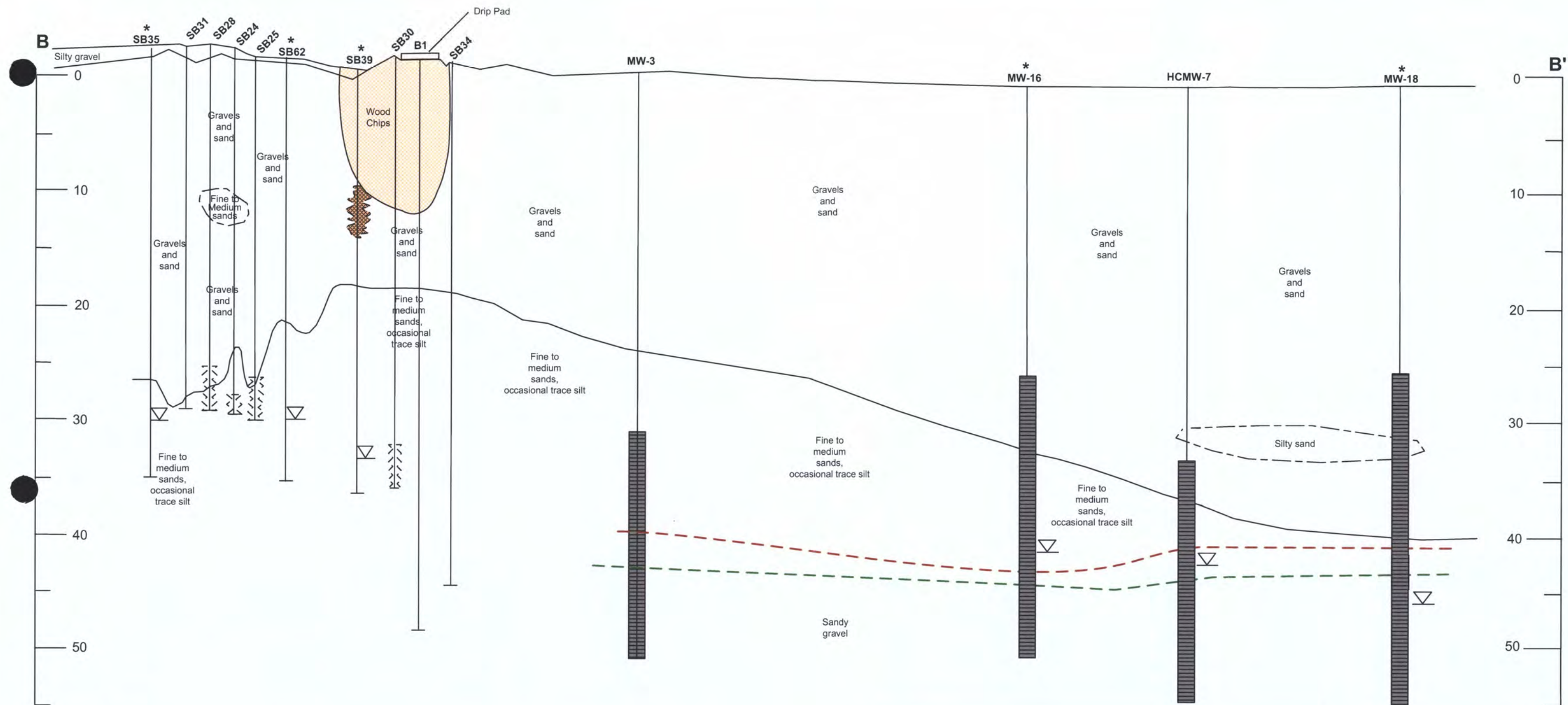
Residual NAPL inferred from historic boring logs	Water level at time of SI boring installation
Residual NAPL observed during SI	Measured groundwater elevation - 4/2004 sampling event
SI boring or well	Measured groundwater elevation - 10/2004 sampling event
Monitoring well - screened interval	



HORIZONTAL SCALE IN FEET
 0 200 400
 0 20 40

VERTICAL SCALE IN FEET
 VERTICAL EXAGGERATION x 5

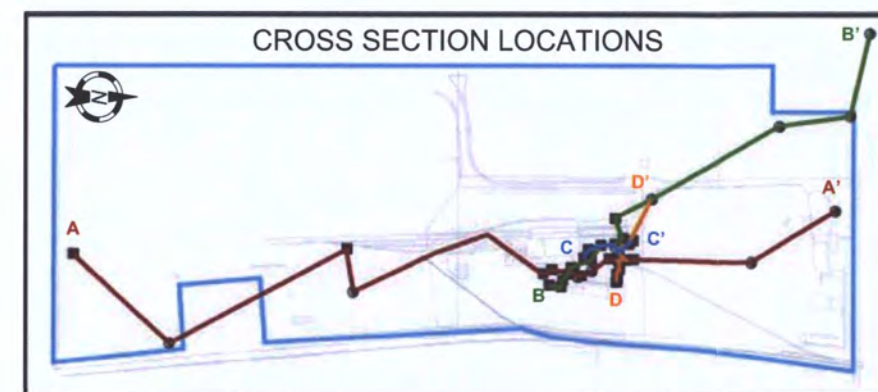
Figure 5-3. Cross Section A - A'



LEGEND

- Residual NAPL inferred from historic boring logs
- Residual NAPL observed during SI
- SI boring or well
- Monitoring well - screened interval
- Water level at SI boring installation

- Measured groundwater elevation - 4/2004 sampling event
- Measured groundwater elevation - 10/2004 sampling event



0 75 150
0 10 20
VERTICAL SCALE IN FEET
VERTICAL EXAGGERATION x 5

Figure 5-4. Cross Section B - B'

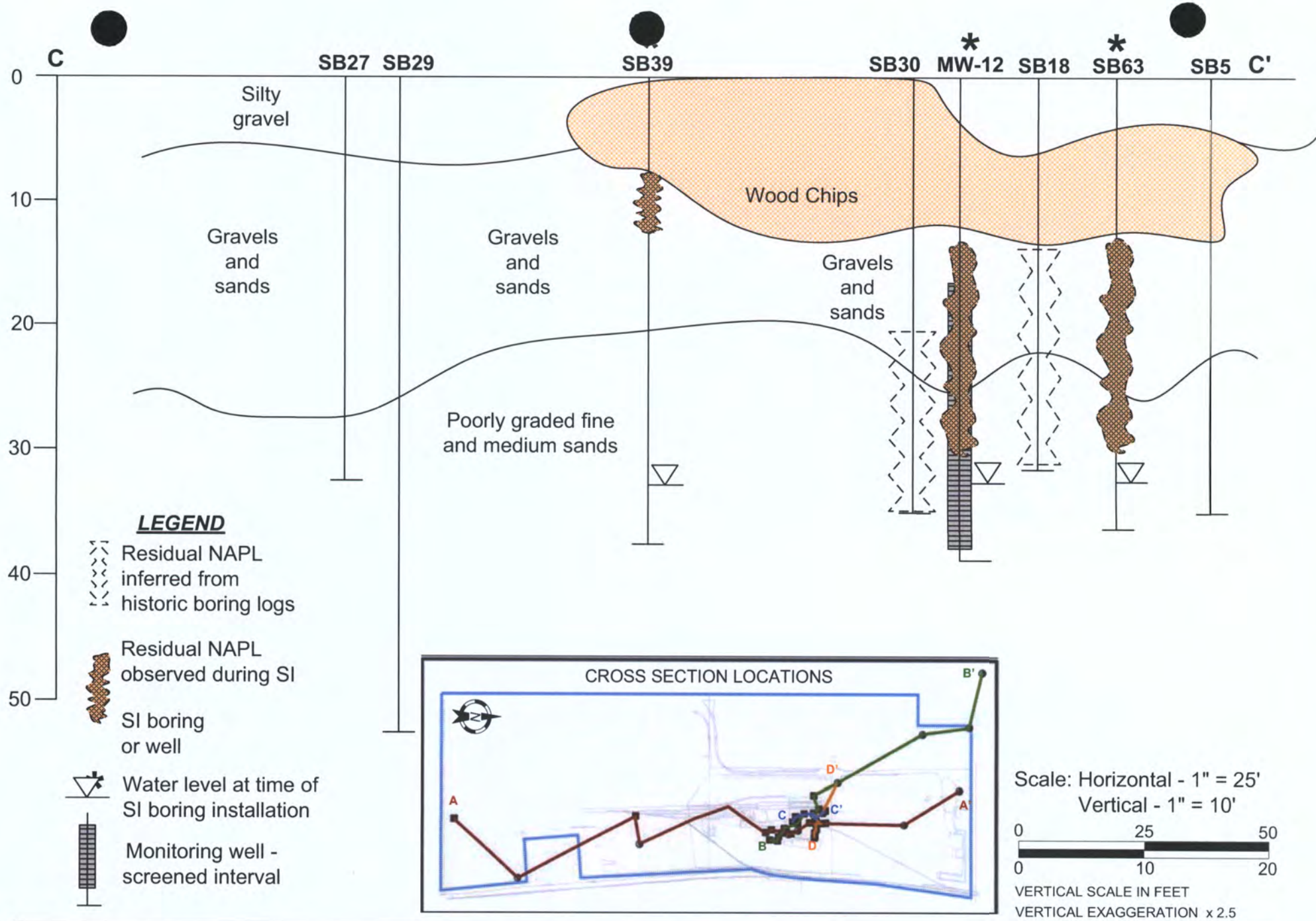


Figure 5-5. Cross Section C - C'

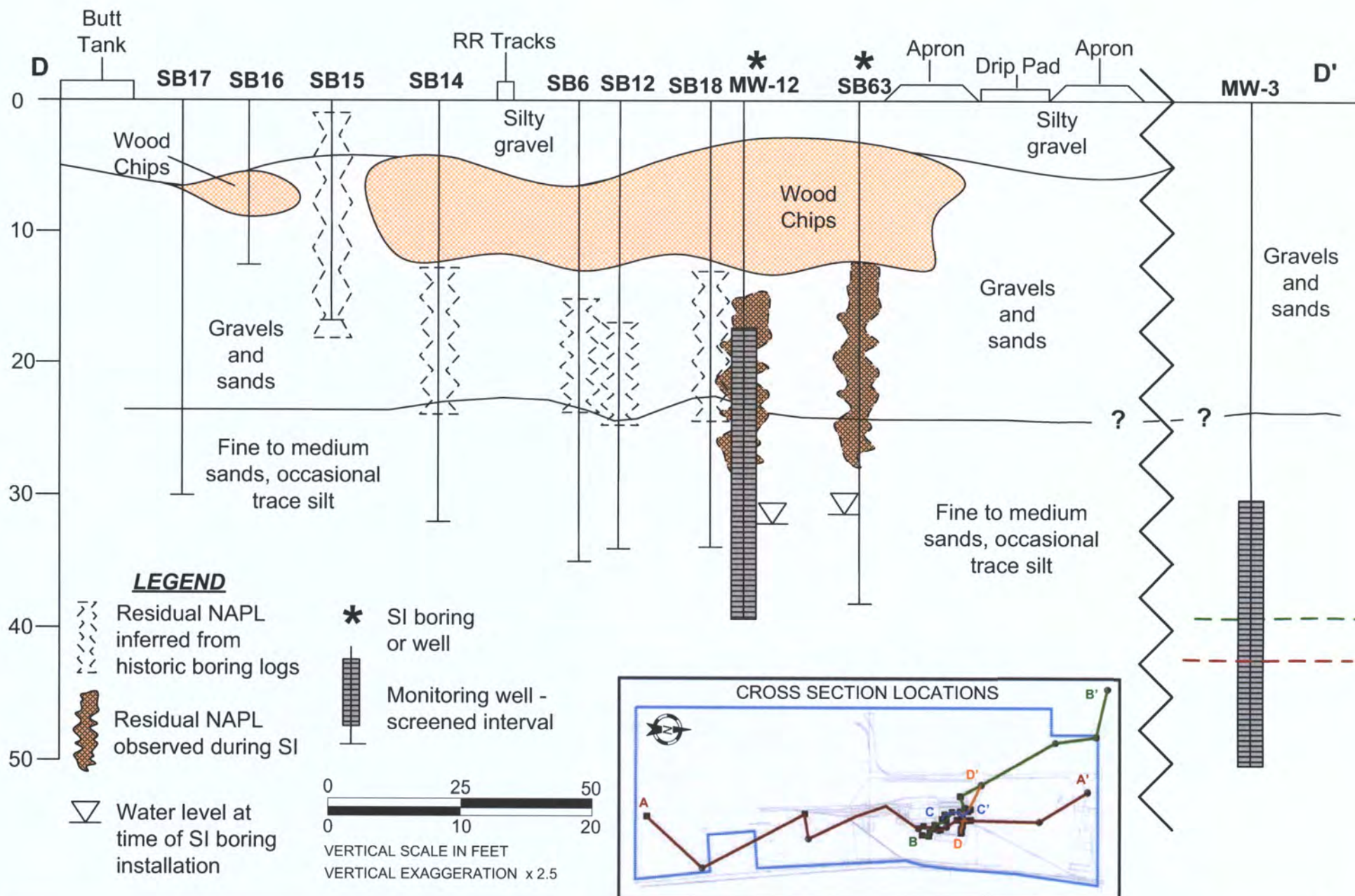


Figure 5-6. Cross Section D - D'

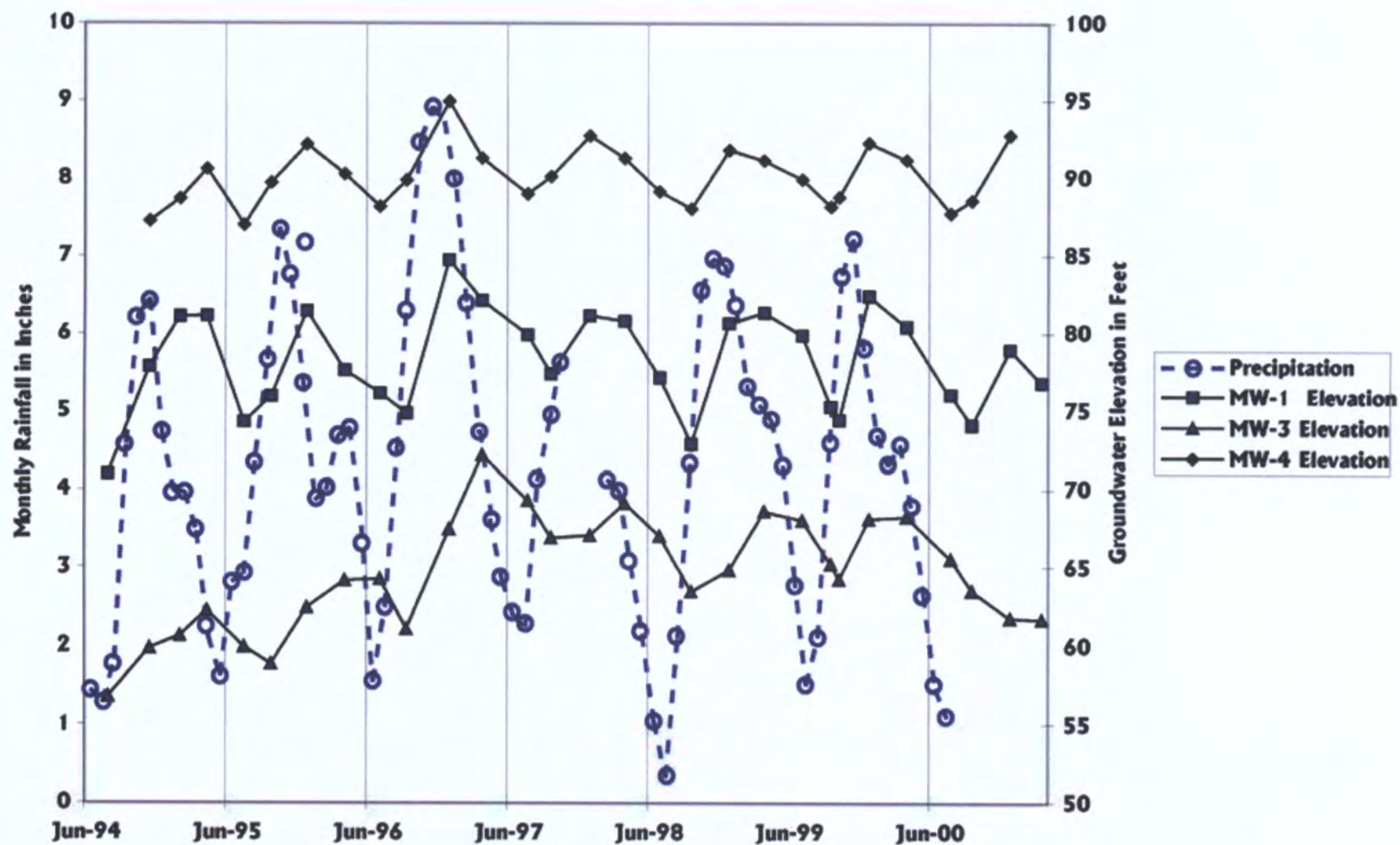


Figure 5-7. Seasonal Precipitation and Groundwater Elevation Trends (1994-2000)

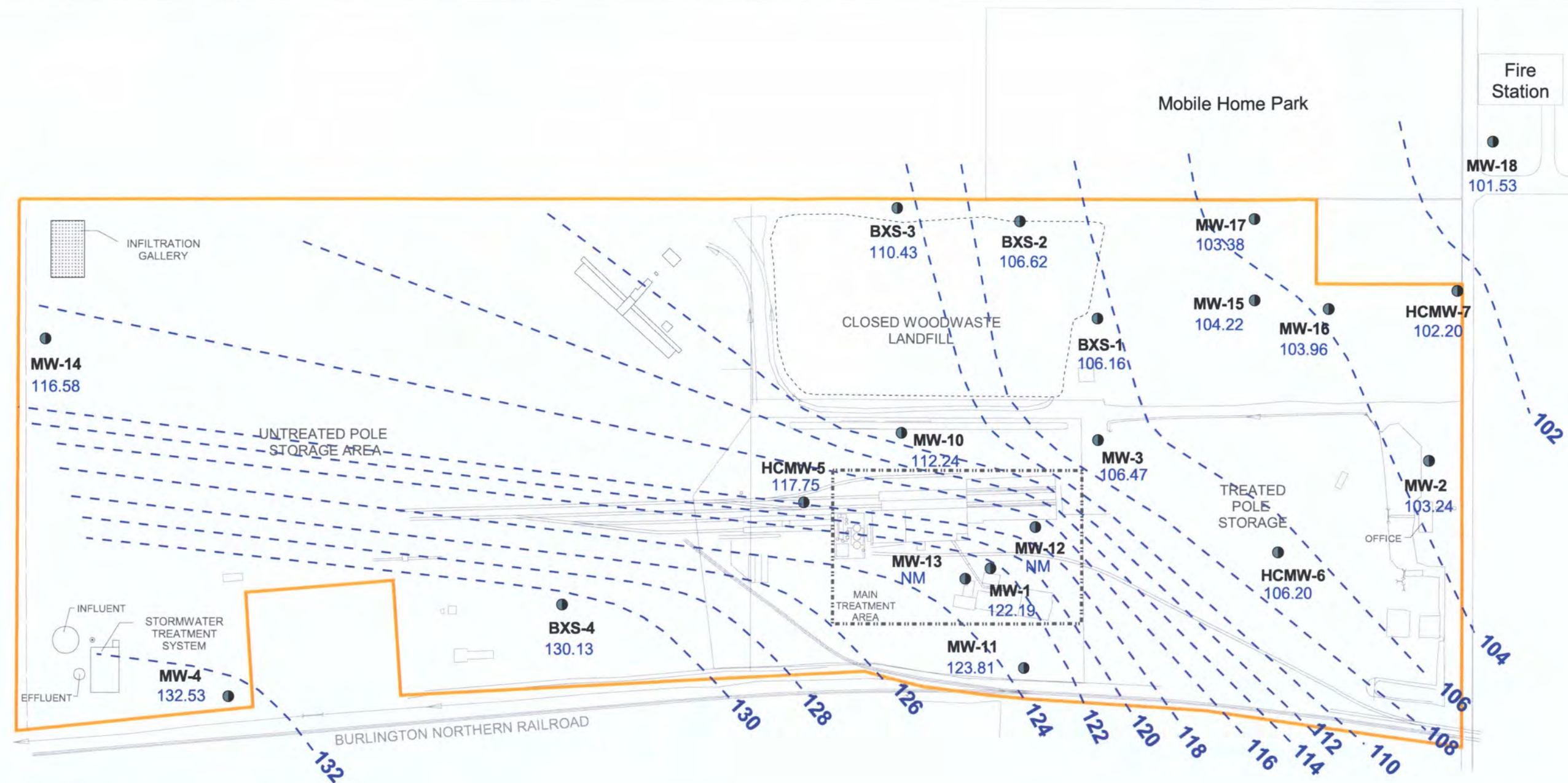


Figure 5-8. Groundwater Elevation Contours - April 4, 2004

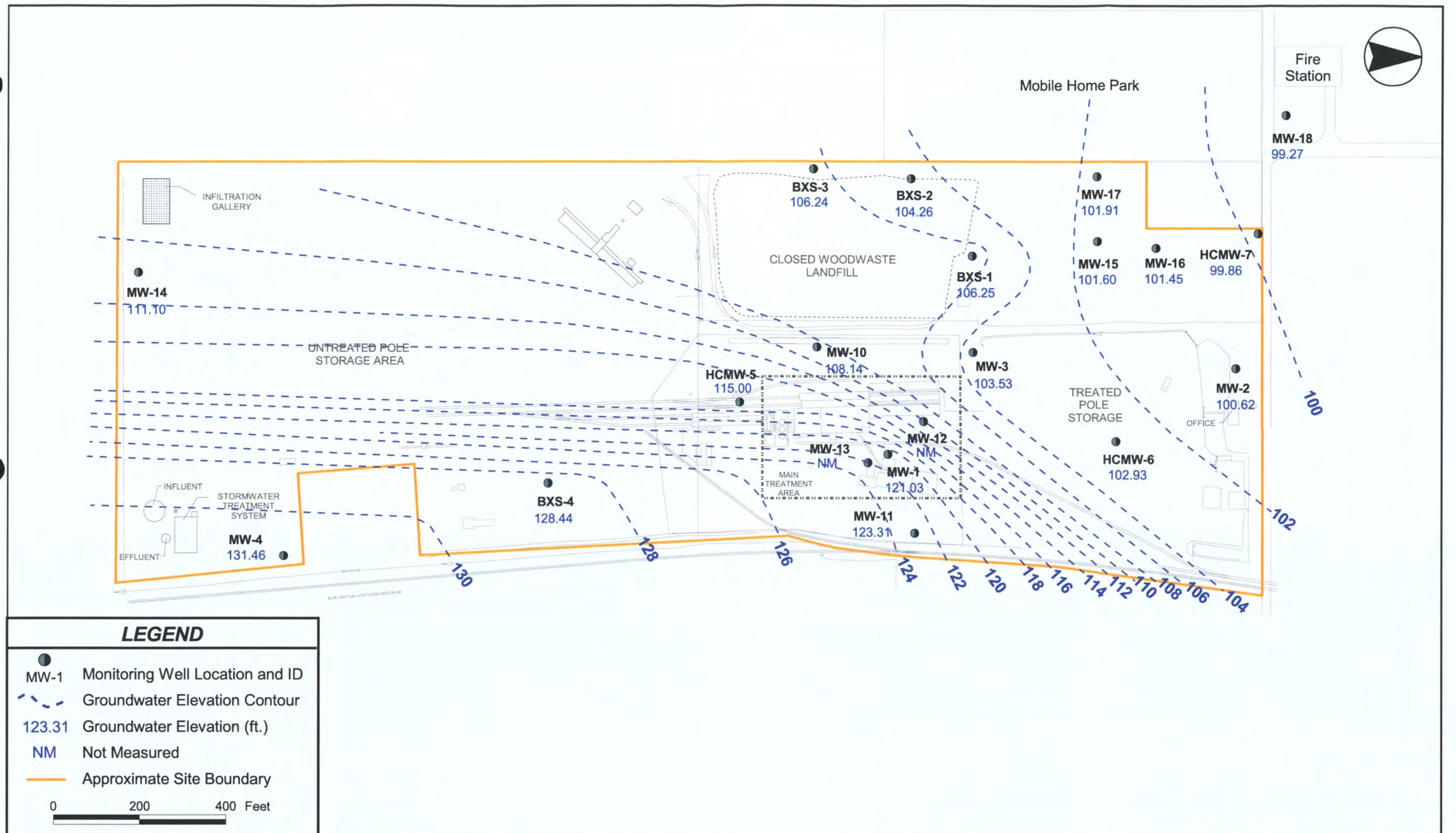
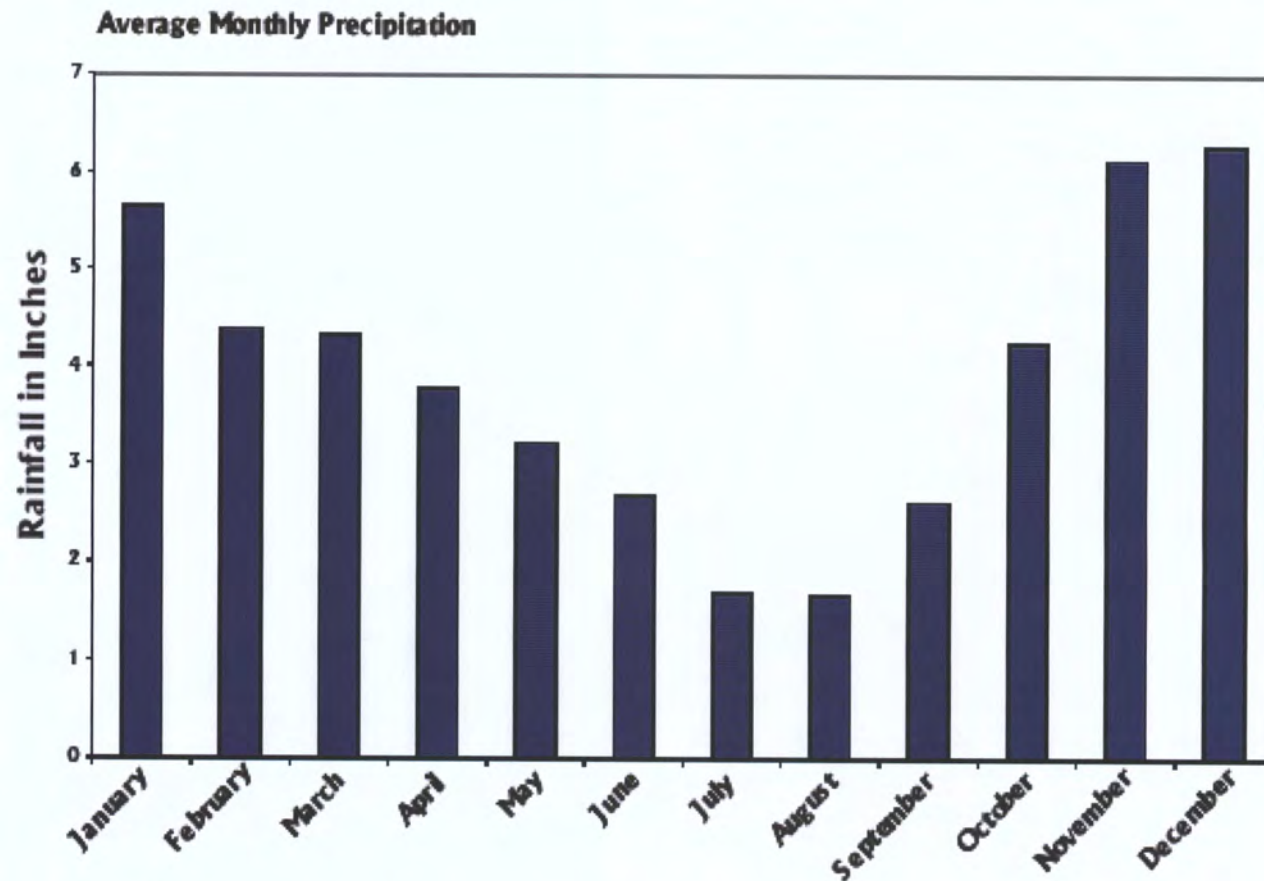


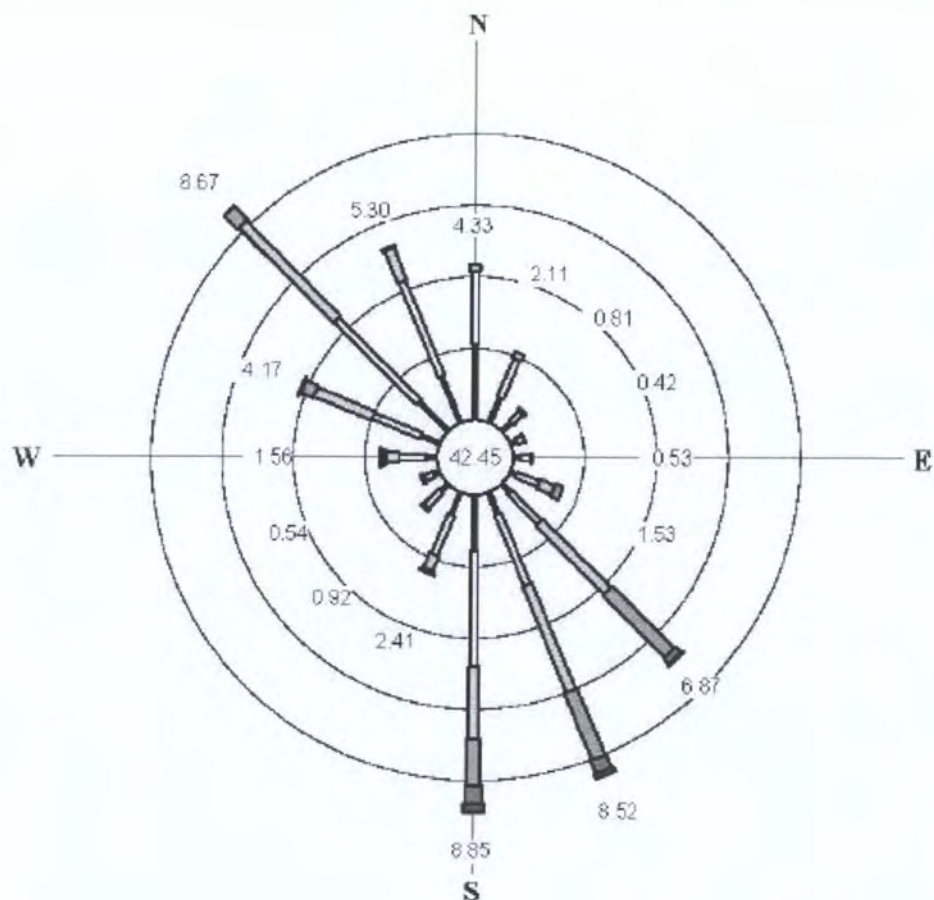
Figure 5-9. Groundwater Elevation Contours - October 18, 2004



Note:
Data from Rainfall recorded at the Arlington Airport Weather Station 1946 to 2000.

Figure 5-10. Arlington Facility Rainfall Data





Wind Speed (mph)

Calms included at center.
Rings drawn at .2% intervals.
Wind flow is FROM the directions shown.

PERCENT OCCURRENCE: Wind Speed (mph)
LOWER BOUND OF CATEGORY

DIR	0.1	3.5	6.9	11.5	18.4	24.2
N	2.12	2.04	0.17	0.00	0.00	0.00
NNE	0.76	1.17	0.18	0.00	0.00	0.00
NE	0.34	0.40	0.07	0.00	0.00	0.00
ENE	0.21	0.21	0.01	0.00	0.00	0.00
E	0.22	0.24	0.07	0.00	0.00	0.00
ESE	0.21	0.65	0.46	0.22	0.00	0.00
SE	0.31	1.16	2.70	2.44	0.22	0.04
SSE	0.63	2.14	3.21	2.02	0.40	0.13

TOTAL OBS = 8283 MISSING OBS = 477

PERCENT OCCURRENCE: Wind Speed (mph)
LOWER BOUND OF CATEGORY

DIR	0.1	3.5	6.9	11.5	18.4	24.2
S	1.53	3.25	2.03	1.29	0.52	0.23
SSW	0.66	1.20	0.46	0.07	0.02	0.00
SW	0.28	0.56	0.08	0.00	0.00	0.00
WSW	0.19	0.25	0.10	0.00	0.00	0.00
W	0.30	0.74	0.35	0.10	0.06	0.01
WNW	0.57	1.41	1.75	0.37	0.04	0.02
NW	1.17	3.24	3.72	0.54	0.00	0.00
NNW	1.41	2.84	0.98	0.07	0.00	0.00

CALM OBS = 3516 PERCENT CALM = 42.45

Figure 5-11. Joint Frequency Distribution for Arlington, WA Airport
1/1/2001 – 12/31/2001 (All Months and Hours)



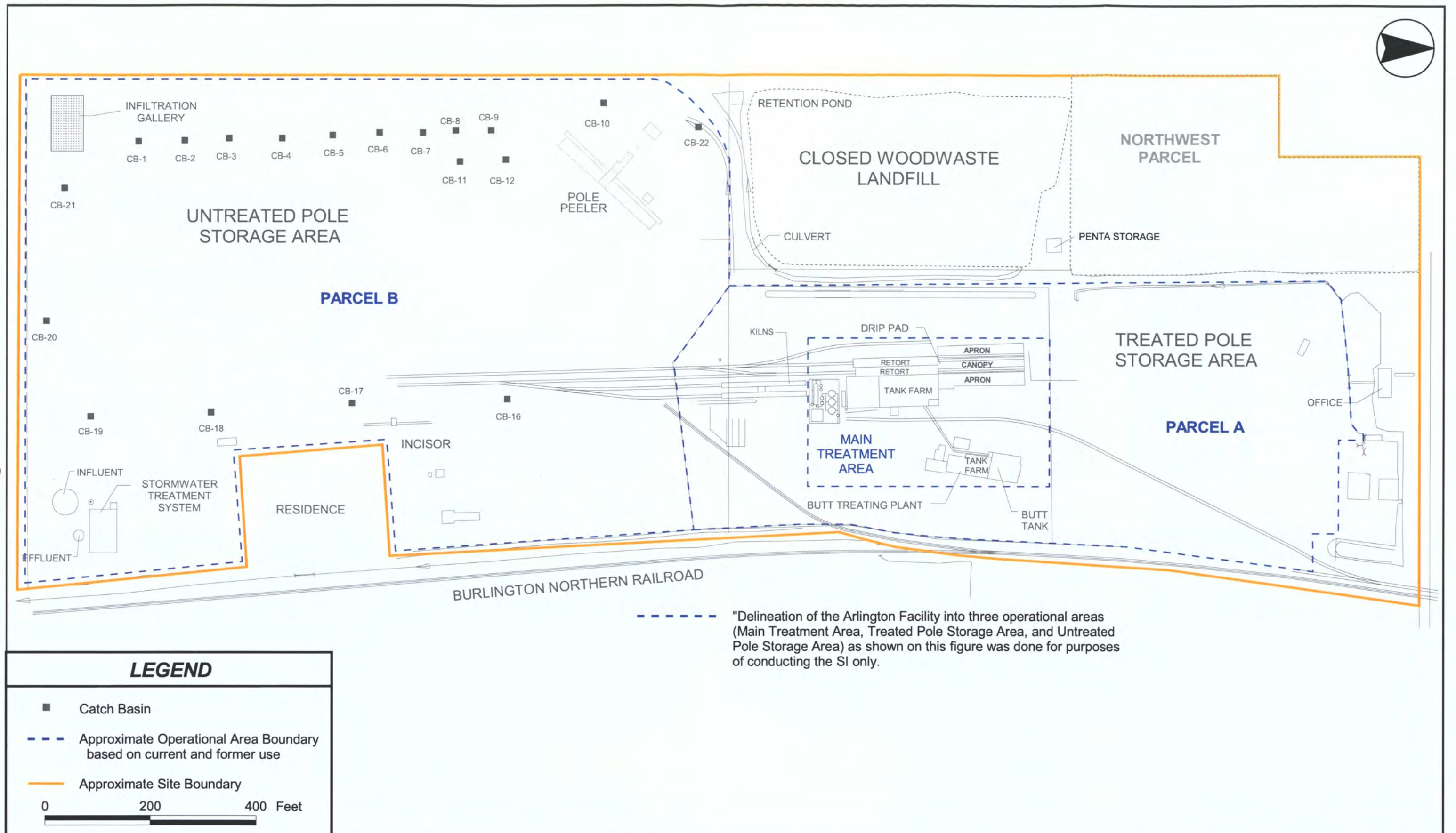


Figure 6-1. Areas of Investigation

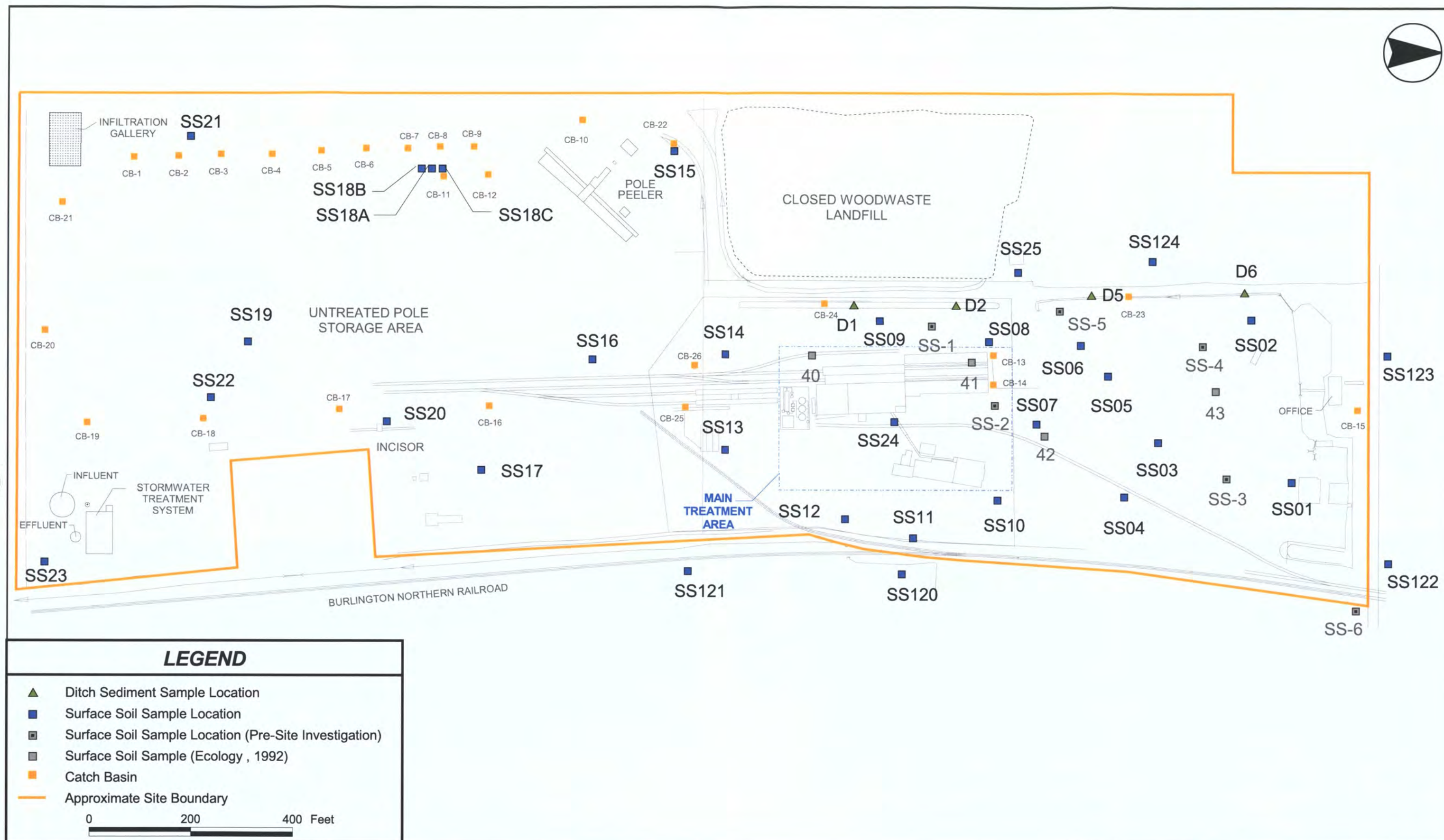


Figure 7-1. Surface Soil and Sediment Sampling Locations

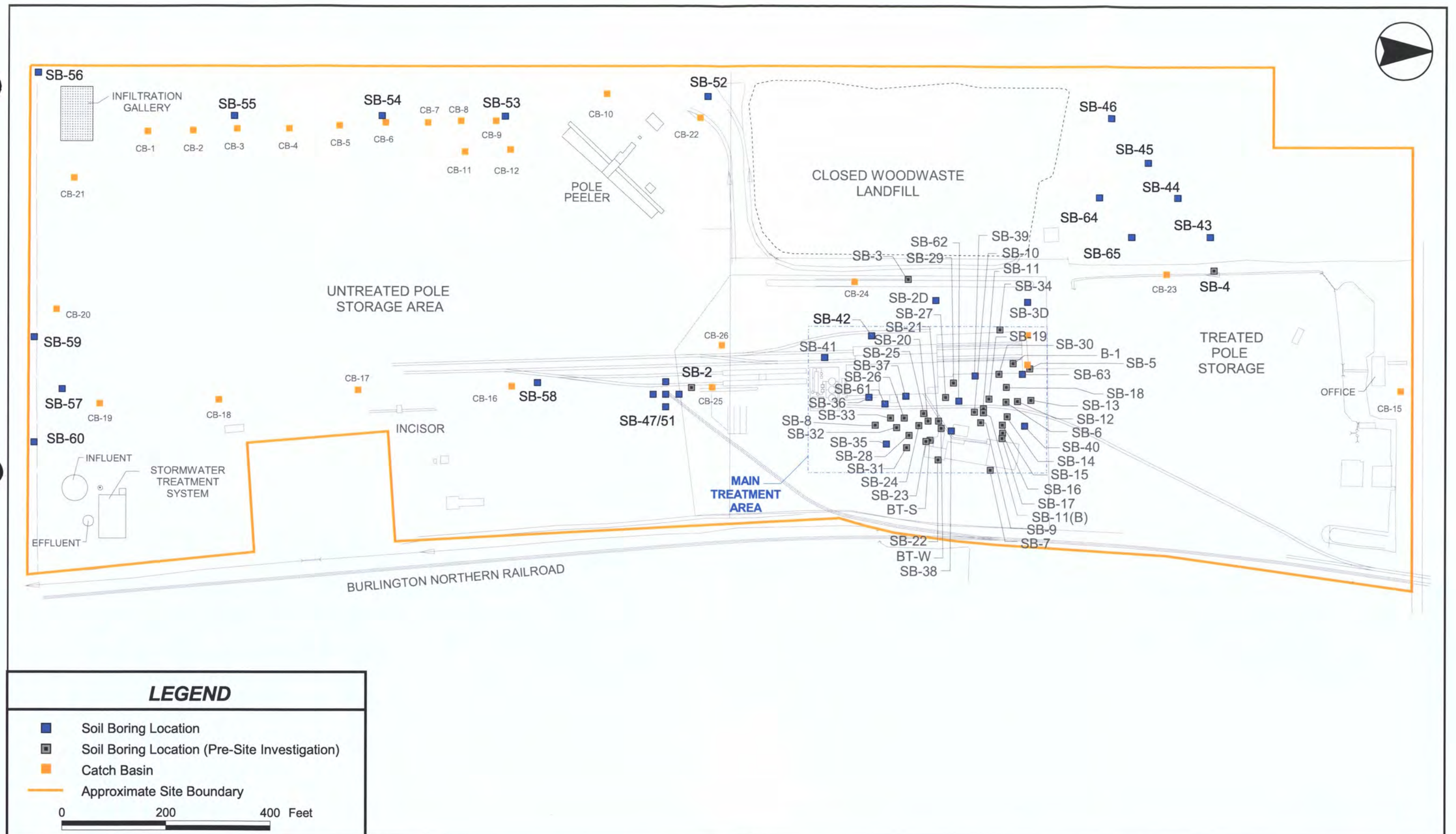


Figure 7-2. Subsurface Borehole Locations

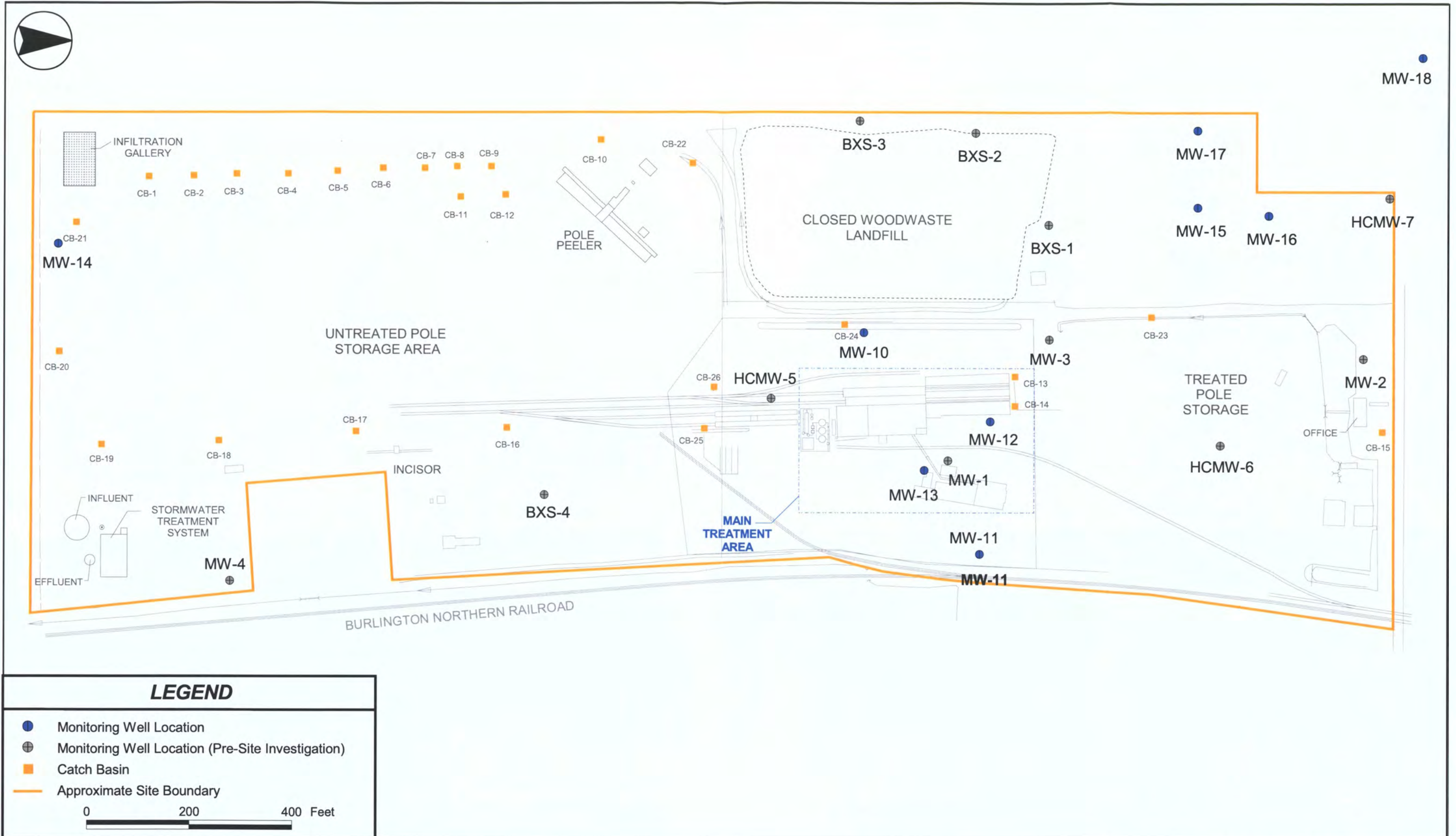


Figure 7-3. Monitoring Well Locations

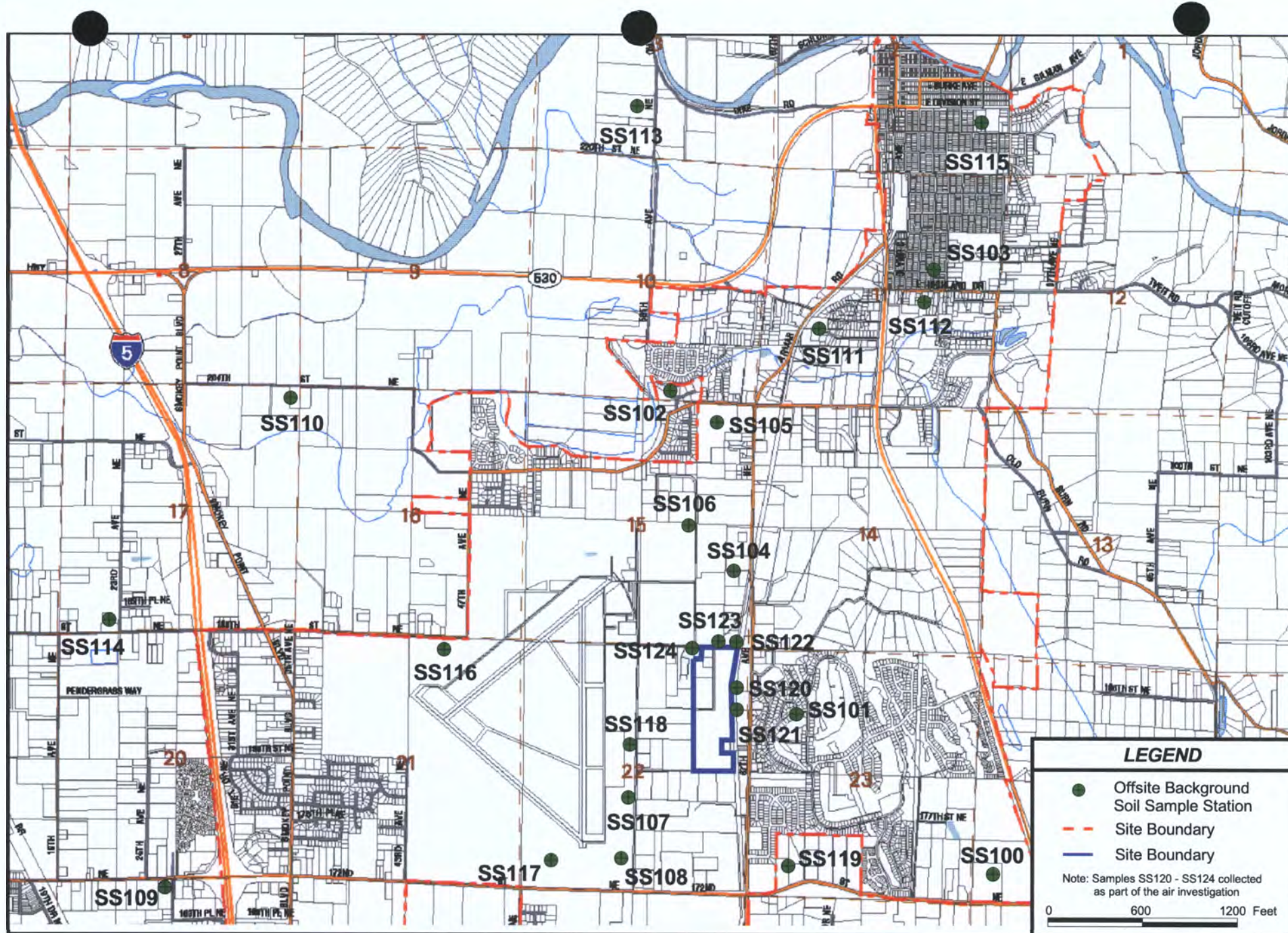


Figure 7-4. Background Soil Sampling Locations

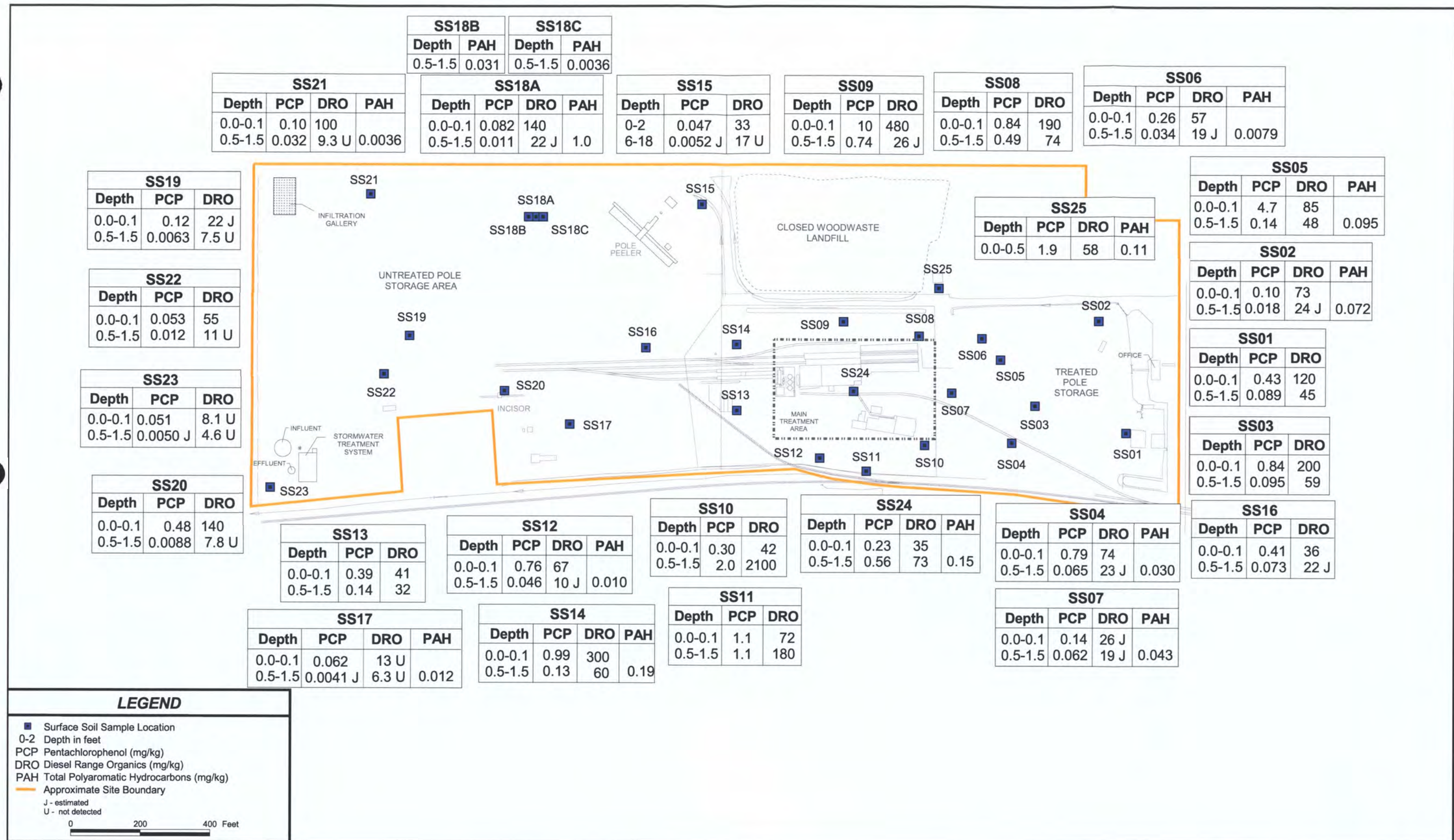


Figure 8-1. COPCs in Surface Soil

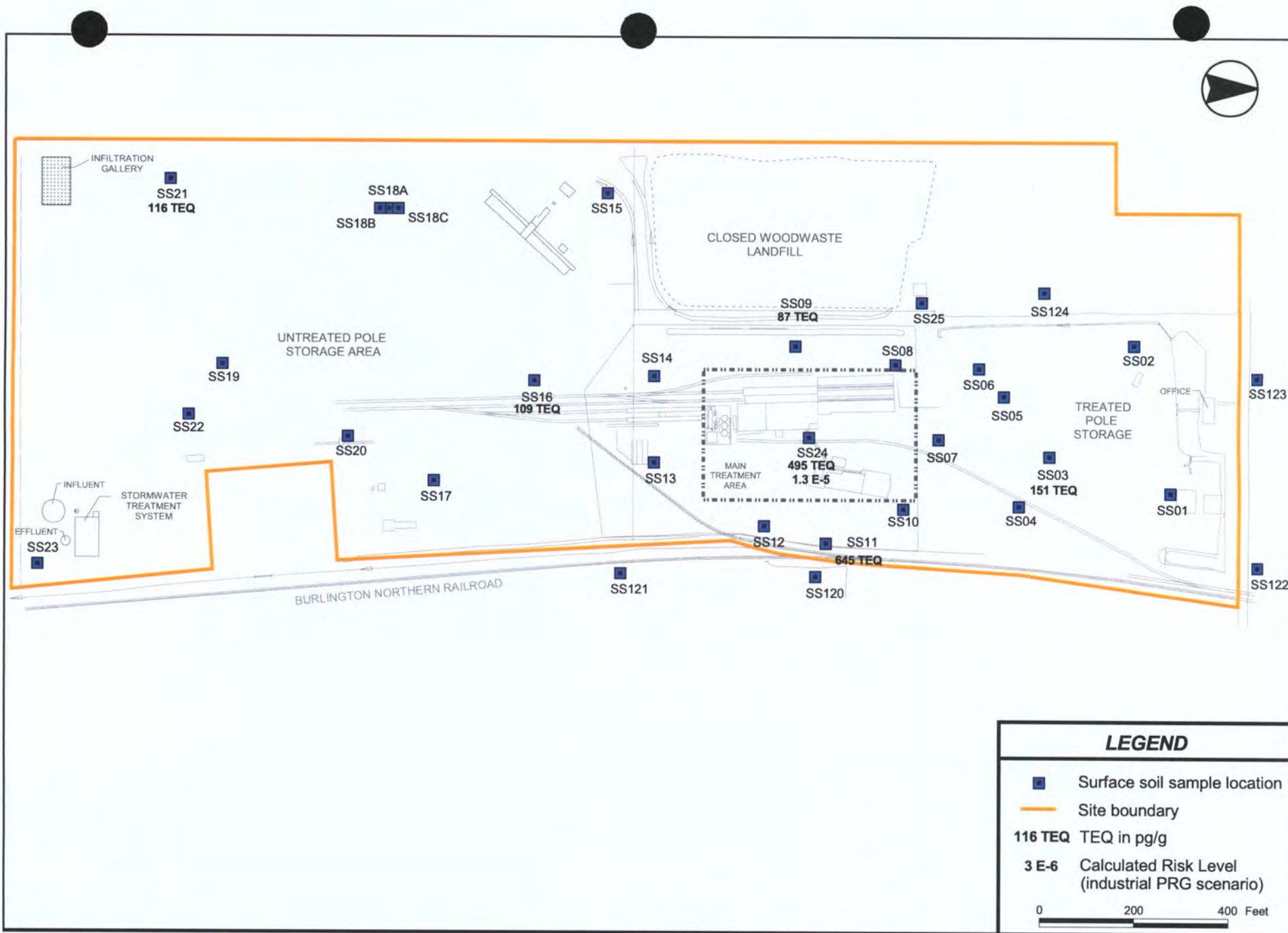


Figure 8-2. PCDD/PCDF in Surface Soil

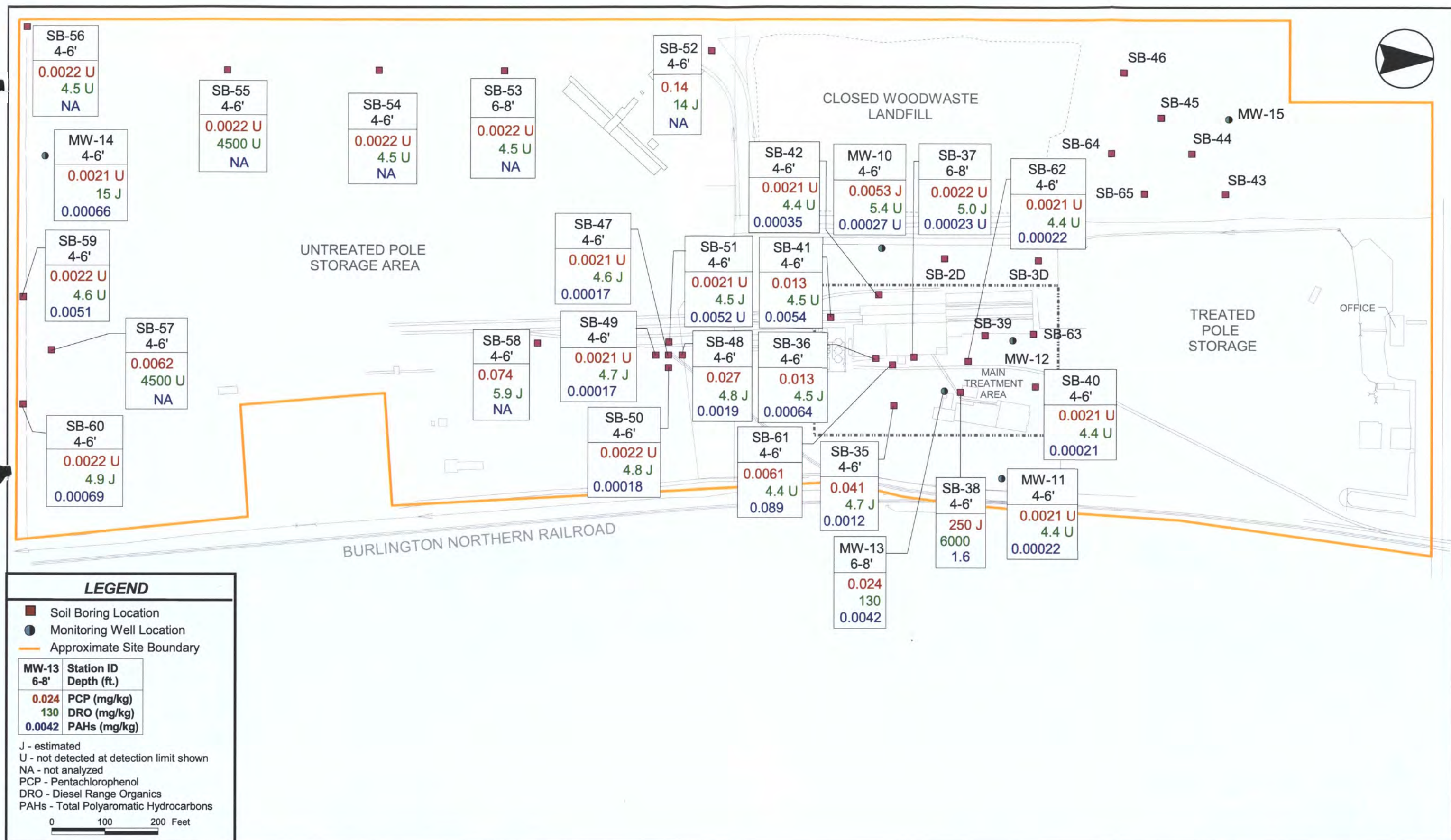


Figure 8-3. COPCs in Subsurface Soil (1.5-10 foot depth)

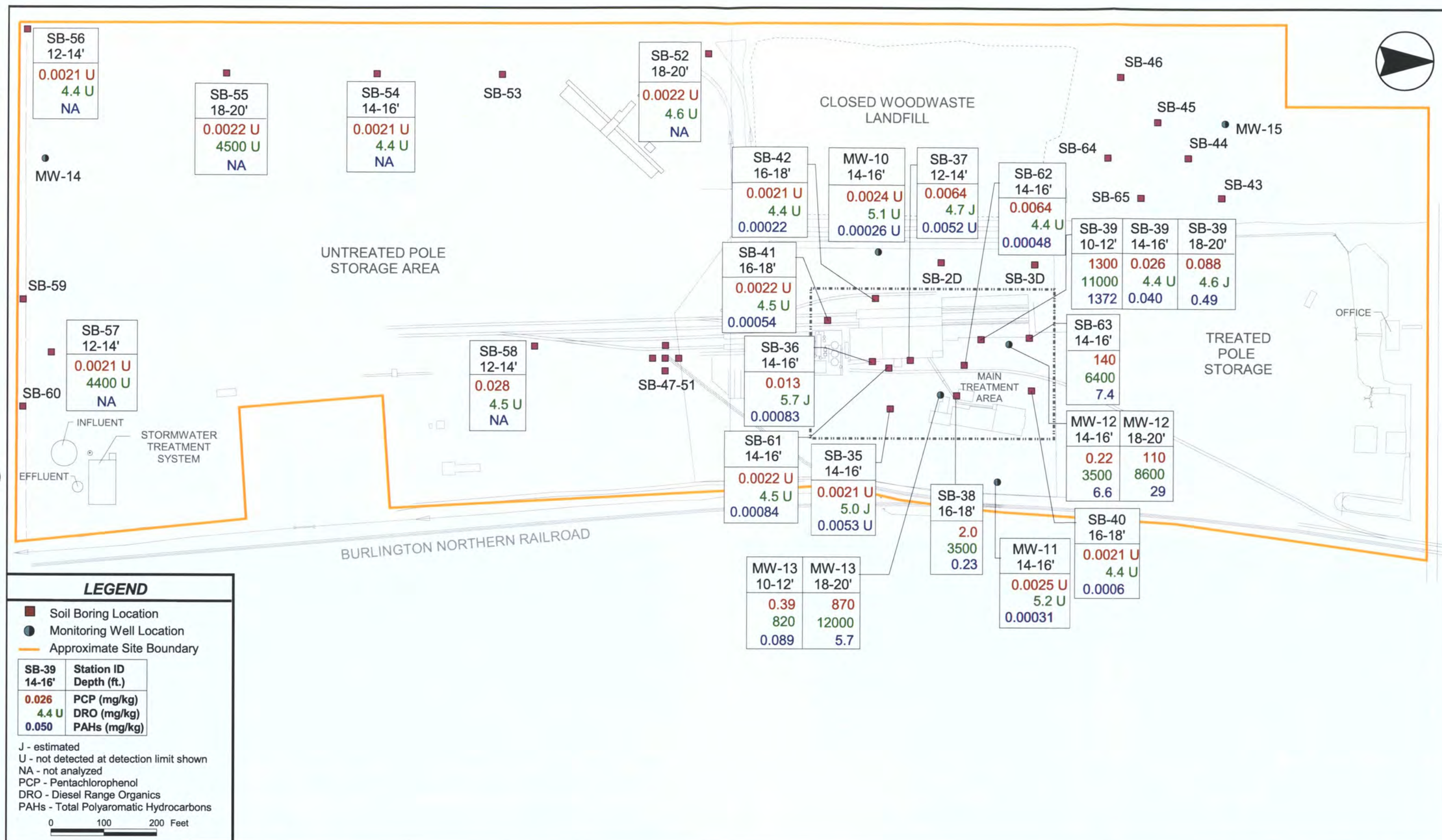


Figure 8-4. COPCs in Subsurface Soil (10-20 foot depth)

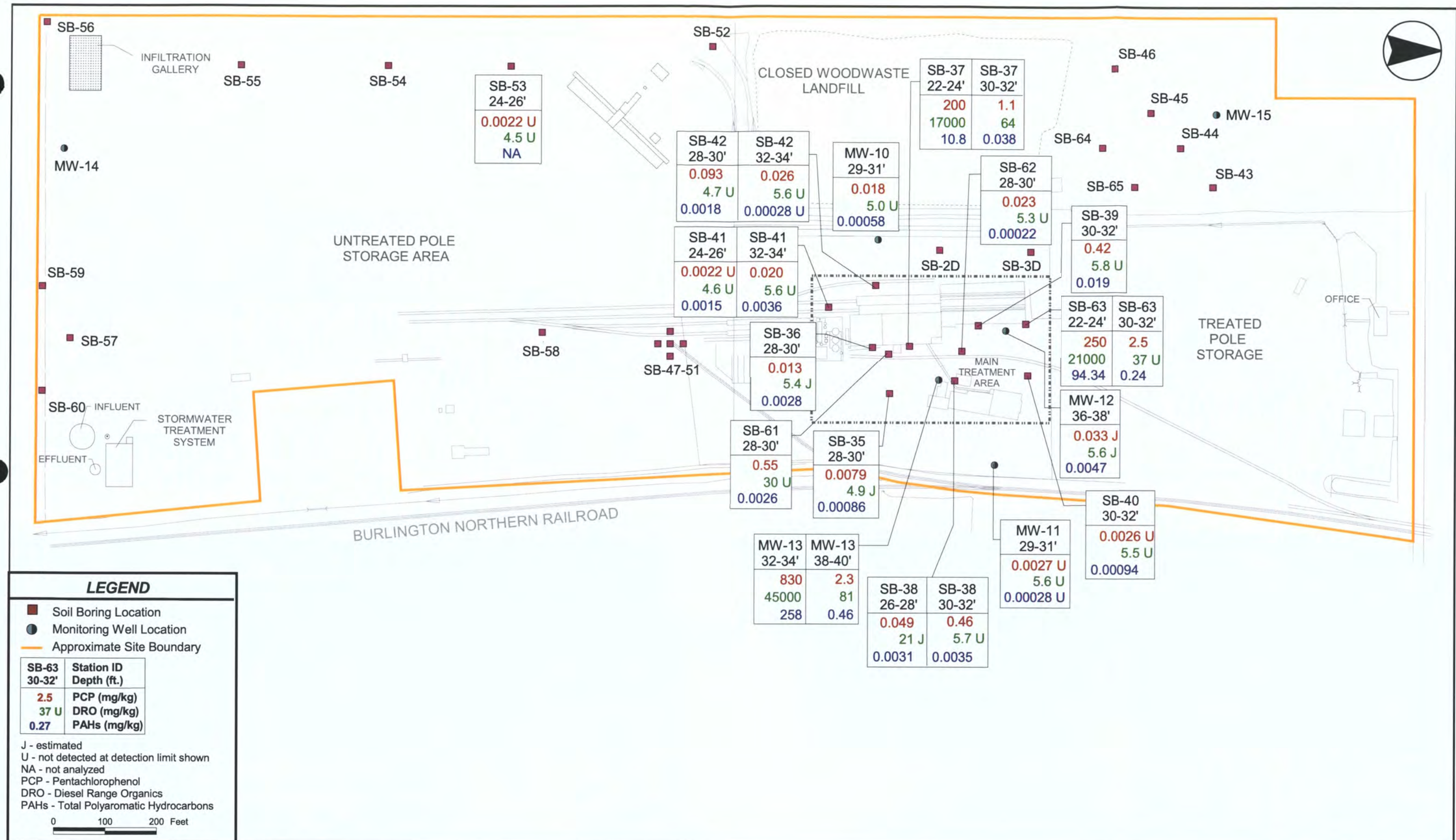


Figure 8-5. COPCs in Subsurface Soil (20-40 foot depth)

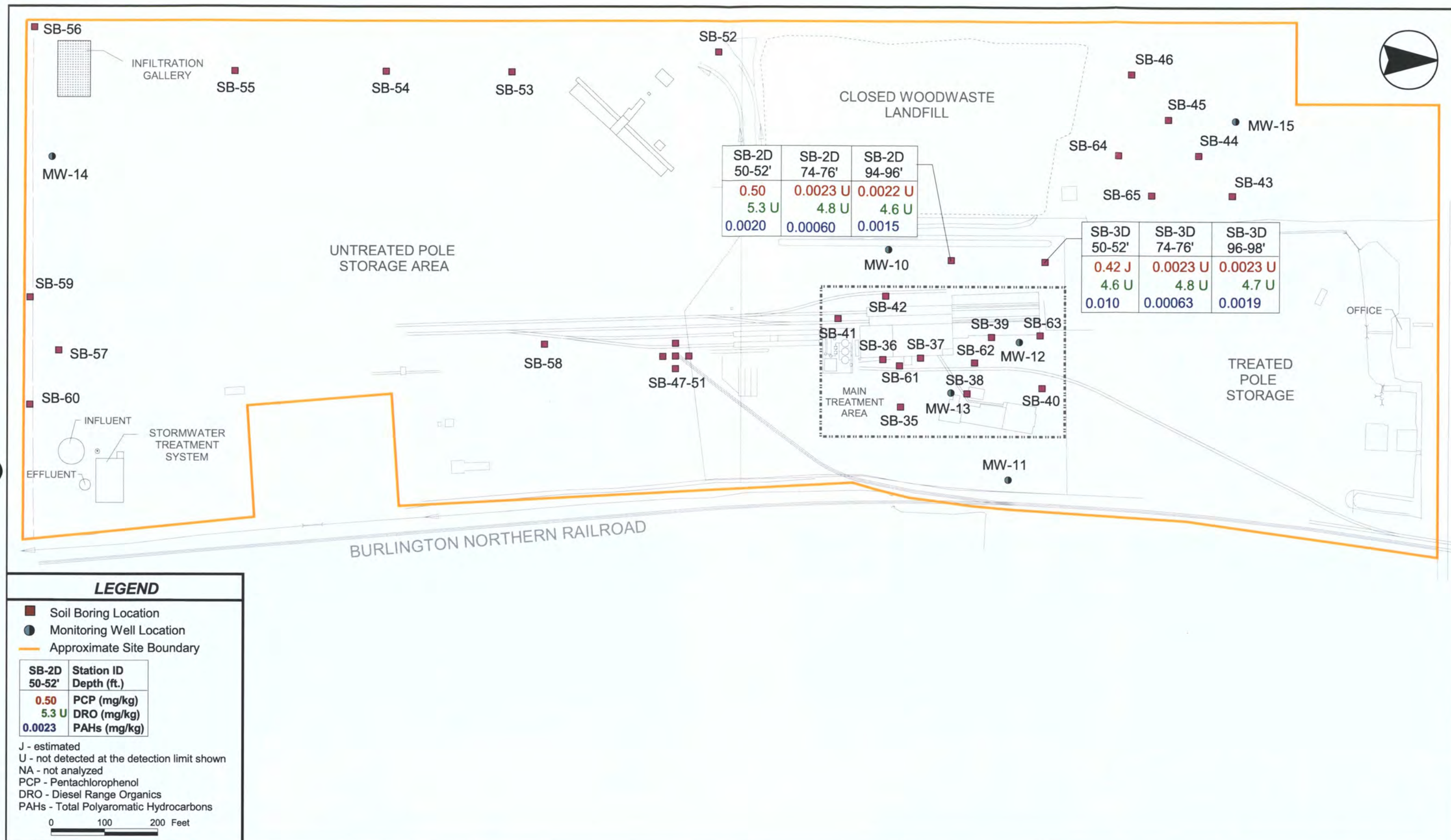


Figure 8-6. COPCs in Subsurface Soil (40+ foot depth)

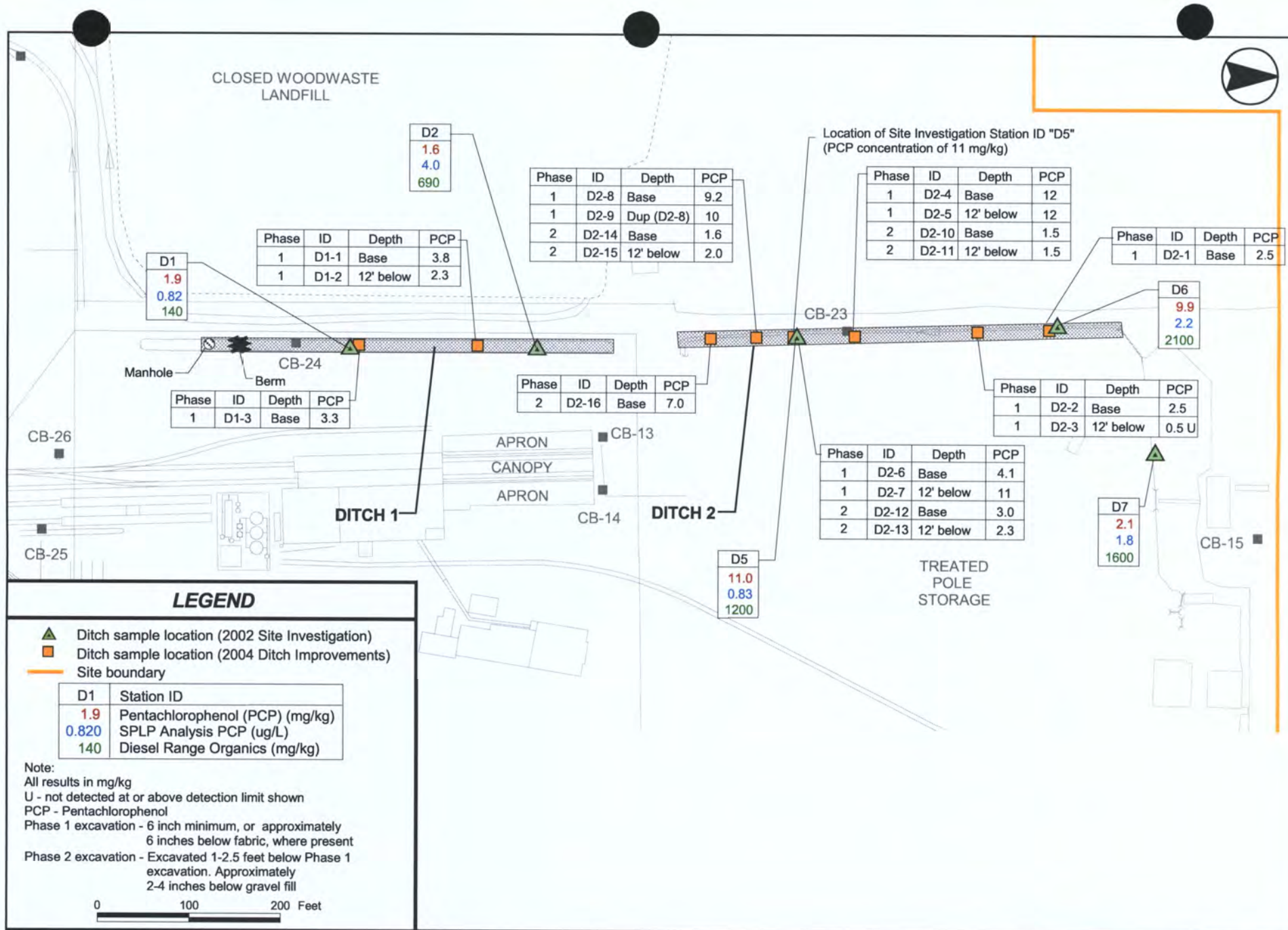


Figure 8-7. COPCs in Ditches and Sediment

Figure 8-8. COPCs in Groundwater - Fall 2002

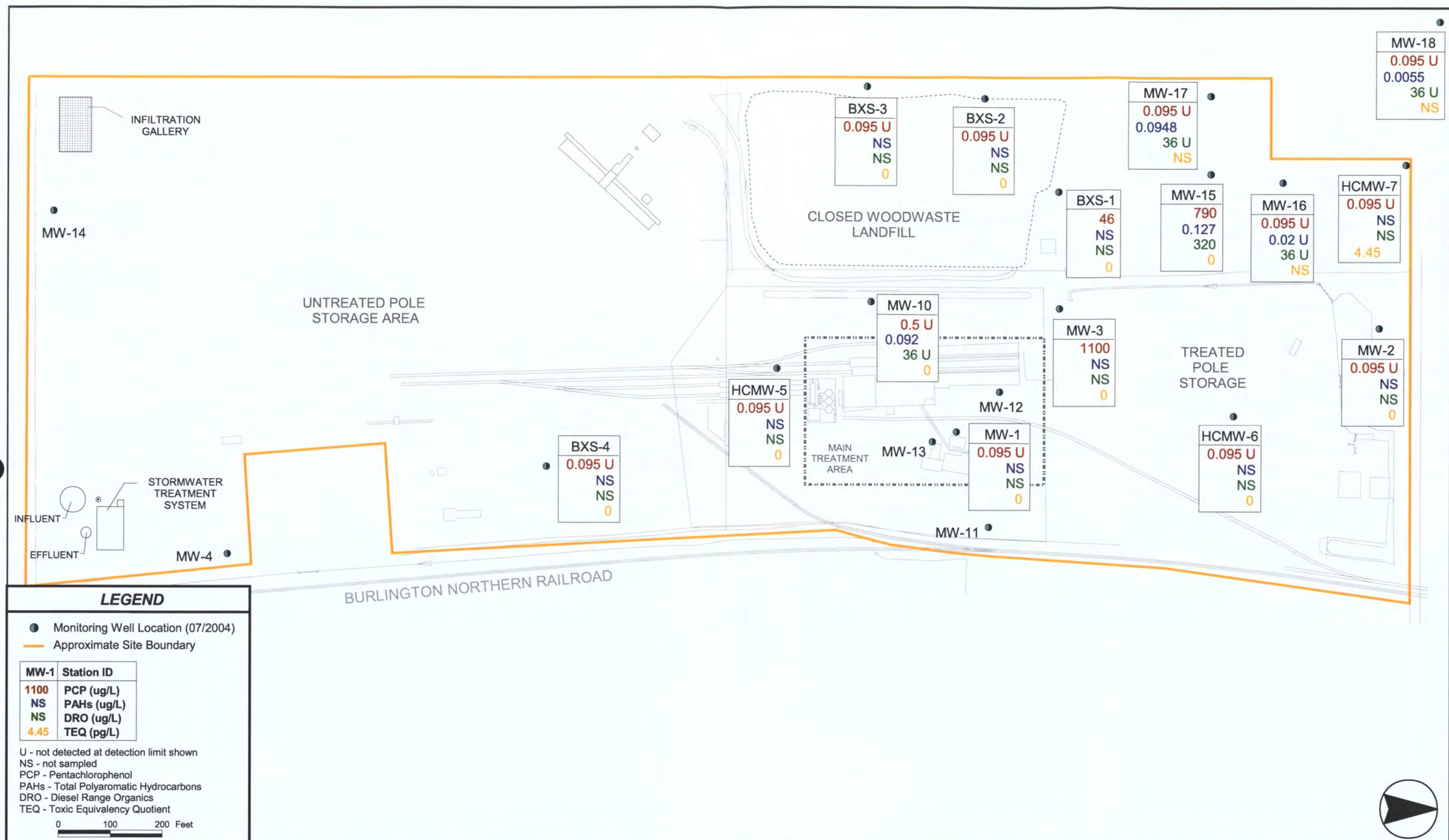
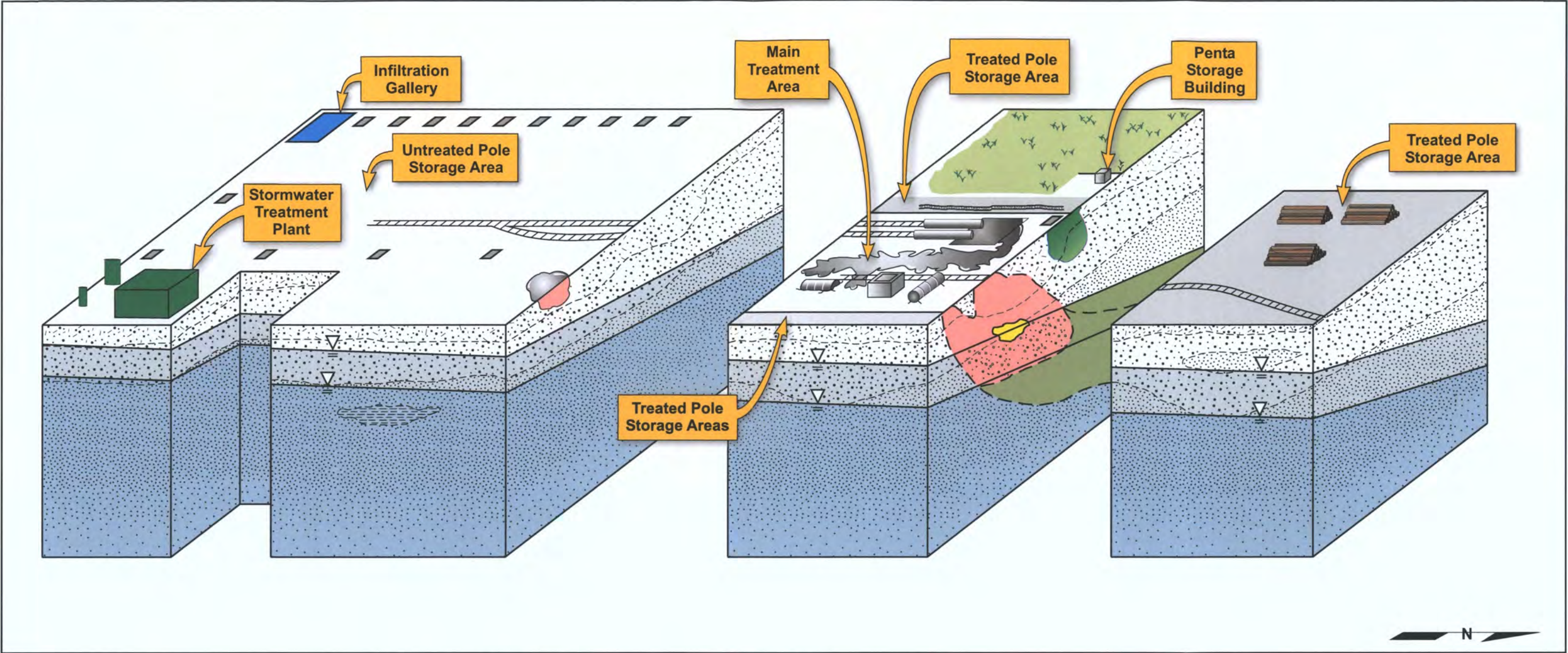


Figure 8-9. COPCs in Groundwater - July 2004

Figure 9-1. Conceptual Site Model



Legend:

- | | | | | | |
|--|---------------------------|--|--------------------------|--|---|
| | Railroad Tracks | | Historical Surface Spill | | Retorts and Drip Apron |
| | Groundwater Seasonal High | | Old Butt Tank | | Closed Wood Waste Landfill |
| | Groundwater Seasonal Low | | Old Thermal Retort | | Potential Residual NAPL |
| | Former Catch Basin | | Old Thermal Tank | | Approximate Area of LNAPL Occurrence |
| | | | Drainage Ditch | | Estimated Area of PCP Plume in Groundwater |
| | | | | | Potential Infiltration of CoPCs to Soil and Groundwater |

- Soil Types**
- FILL (Silty SAND with Gravel)
 - Fine SAND
 - Gravelly SAND
 - Silty CLAY

Note: Surface features shown larger than actual size.

Horizontal Scale in Feet
0 300 600
0 30 60
Vertical Scale in Feet
Vertical Exaggeration x10

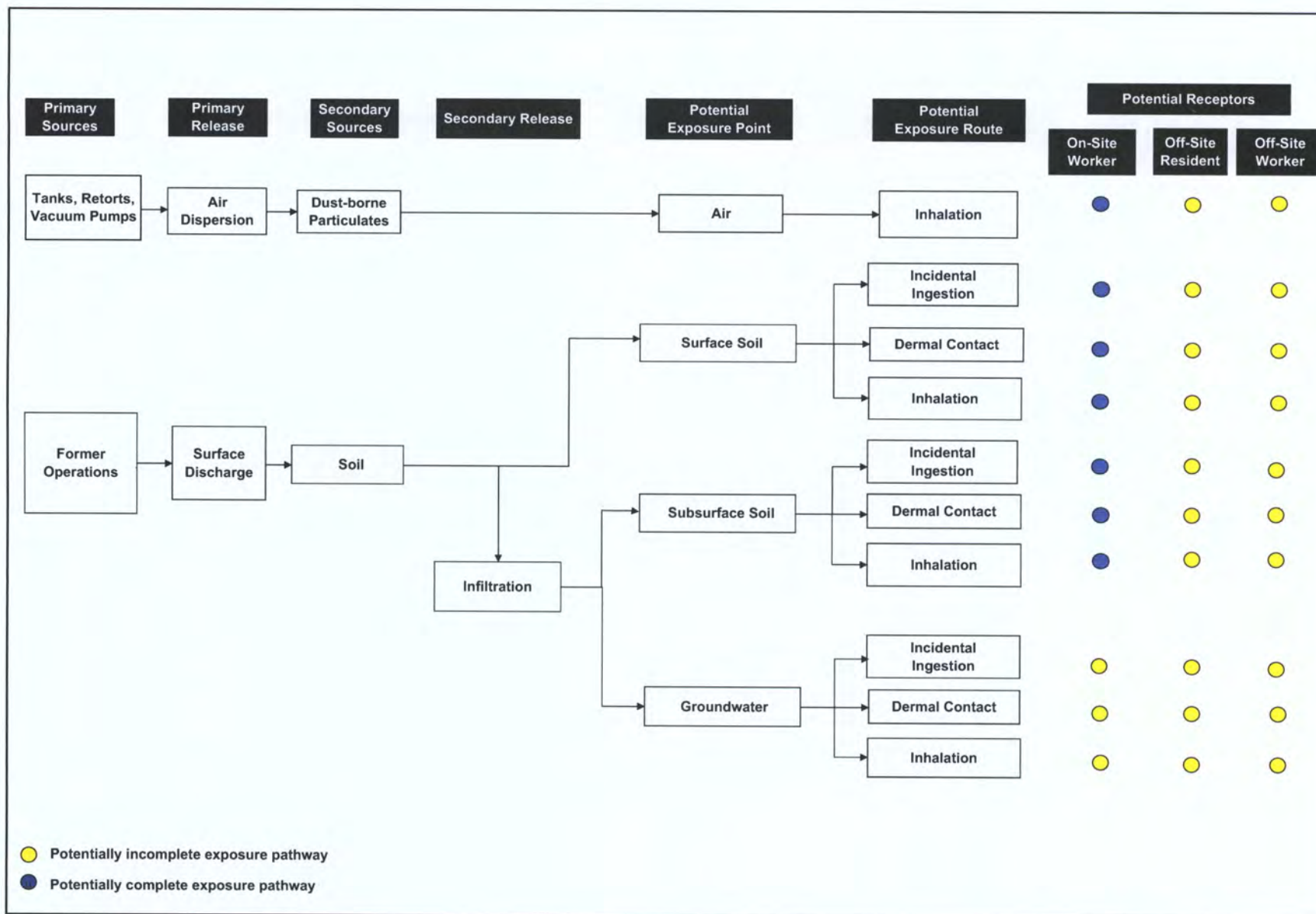


Figure 9-2. Preliminary Conceptual Site Model of Potential Exposure Pathways

Tables

Table 5-1. Hydraulic Conductivity Data

Well/Borehole ID	Material in Screen Interval	Type of Test	Hydraulic Conductivity in ft/day (cm/sec)
MW-1	Fine Sand, trace of silt	Slug rod test	4 to 6 (2×10^{-3})
MW-3	Screened in both sandy Gravel and fine Sand	Slug rod test	100 to 150 (4×10^{-2})
BXS-2	Fine to medium Sand	Bailed slug test	2 to 6 (1.4×10^{-3})
BXS-4	Silty Sand; with gravel; decrease in silt with depth	Bailed slug test	0.2 to 1 (2×10^{-4})
SB-2, composite 17.5 to 19 and 22.5 to 24 feet	Medium to fine Sand	Hazen's: $D10^2$	76 (2.6×10^{-2})
HCMW-5, 30 to 31.5 feet	Slightly silty, medium Sand	Hazen's: $D10^2$	21 (7.5×10^{-3})
SB-4, 12.5 to 14 feet	Gravelly Sand	Hazen's: $D10^2$	143 (5×10^{-2})
SB-5, 32.5 to 34 feet	Silty, fine Sand	Hazen's: $D10^2$	4 (1×10^{-3})

Table 8-1. Summary of Surface Soil Results

Analyte	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	Soil PRG - Residential	Num Greater than Residential PRG	Soil PRG - Industrial	Num Greater than Industrial PRG
Conventionals (units as noted)									
Carbon, Total Organic (TOC) (%)	10/10	0.19	1.59	SS-1	10/4/99				
pH	15/15	5.29	8.67	SS-2	10/1/99				
Solids, Total (%)	65/65	85	99.2	SS12	8/12/02				
Petroleum Hydrocarbons (mg/Kg)									
Diesel fuel	0/4	na	na						
Diesel Range Organics	41/51	10	2100	SS10	10/10/02	2000 mg/kg	2000 mg/kg		NR
Heavy Fuel Oil #6	0/4	na	na						A
Jet Fuel as Jet A	0/4	na	na						
Kerosene	0/4	na	na						
Lube Oil (Motor)	3/4	60	630	SS-1	10/1/99				
Mineral Spirits	0/4	na	na						
Non-PHC as Diesel	0/4	na	na						
PHC as Diesel	1/4	1400	1400	SS-2	10/8/99				
Residual Range Organics (RRO)	45/51	49	1500	SS10	10/10/02				
Semi-volatile organic compounds (mg/Kg)									
2,4,5-Trichlorophenol	0/51	na	na			6100	na	62000	na
2,4,6-Trichlorophenol	0/63	na	na			6.1	na	62	na
2-Methylnaphthalene	11/15	0.00032	0.0049	SS25	9/30/03				
3,4-Dichlorophenol	0/51	na	na						
3,5-Dichlorophenol	0/51	na	na						
Acenaphthene	2/15	0.00023	0.00038	SS24	9/19/02	3700	0	29000	0
Acenaphthylene	8/15	0.00017	0.014	SS18A	8/9/02				
Anthracene	12/15	0.00023	0.026	SS18A	8/9/02	22000	0	100000	0
Benzo(a)anthracene	14/15	0.00023	0.065	SS18A	8/9/02	0.62	0	2.1	0
Benzo(a)pyrene	13/15	0.00039	0.13	SS18A	8/9/02	0.062	1	0.21	0
Benzo(b)fluoranthene	15/15	0.00028	0.24	SS18A	8/9/02	0.62	0	2.1	0
Benzo(ghi)perylene	15/15	0.00033	0.11	SS18A	8/9/02				
Benzo(k)fluoranthene	15/15	0.00018	0.17	SS18A	8/9/02	6.2	0	21	0
Chrysene	15/15	0.00056	0.12	SS18A	8/9/02	62	0	210	0
Dibenzo(a,h)anthracene	12/15	0.00021	0.022	SS18A	8/9/02	0.062	0	0.21	0
Fluoranthene	15/15	0.00052	0.018	SS14	8/12/02	2300	0	22000	0
Fluorene	5/15	0.00024	0.0011	SS25	9/30/03	2700	0	26000	0
Indeno(1,2,3-c,d)pyrene	15/15	0.0002	0.12	SS18A	8/9/02	0.62	0	2.1	0
Naphthalene	11/15	0.00028	0.0072	SS02	8/7/02	56	0	190	0

Table 8-1. Summary of Surface Soil Results (Continued)

Analyte	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	Soil PRG - Residential	Num Greater than Residential PRG	Soil PRG - Industrial	Num Greater than Industrial PRG
Pentachlorophenol (PCP)	63/63	0.0041	90	SS-3	10/1/99	3	8	9	4
Phenanthrene	15/15	0.0003	0.0085	SS25	9/30/03				
Pyrene	15/15	0.00044	0.03	SS14	8/12/02	2300	0	29000	0
Tetrachlorophenols, Total	9/63	0.0082	1.7	SS-3	10/1/99				
Total PAHs (calculated)	15/15	0.00359	1.04343	SS18A	8/9/02				
Dioxins/Furans (pg/g)									
2,3,7,8-Tetrachlorodibenzo-p-dioxin	7/19	0.859	31.321	SS-4	10/1/99				
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	12/19	10.317	818.386	SS-4	10/1/99				
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	12/19	32.176	2462.608	SS-3	10/1/99				
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	12/19	71.671	4966.084	SS-3	10/1/99				
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	12/19	114.02	6756.321	SS-1	10/1/99				
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	12/19	2654.949	182350.835	SS-3	10/1/99				
Octachlorodibenzo-p-dioxin	12/19	22118.668	2061571.2	SS-3	10/1/99				
2,3,7,8-Tetrachlorodibenzofuran	7/19	1.032	6.929	SS-1	10/1/99				
1,2,3,7,8-Pentachlorodibenzofuran	8/19	4.35	221.371	SS-3	10/1/99				
2,3,4,7,8-Pentachlorodibenzofuran	7/19	3.119	22.769	SS11	8/12/02				
1,2,3,4,7,8-Hexachlorodibenzofuran	12/19	18.341	18169.019	SS-3	10/1/99				
1,2,3,6,7,8-Hexachlorodibenzofuran	7/19	13.27	95.265	SS11	8/12/02				
1,2,3,7,8,9-Hexachlorodibenzofuran	4/19	3.723	24.404	SS03	8/9/02				
2,3,4,6,7,8-Hexachlorodibenzofuran	7/19	25.934	208.767	SS11	8/12/02				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	12/19	429.561	35205.088	SS-3	10/1/99				
1,2,3,4,7,8,9-Heptachlorodibenzofuran	10/19	23.904	2850.065	SS-3	10/1/99				
Octachlorodibenzofuran	12/19	1076.798	376801.558	SS-3	10/1/99				
Total TCDD	7/19	2.262	38.819	SS24	9/19/02				
Total PeCDD	12/19	37.087	1710.322	SS-4	10/1/99				
Total HxCDD	12/19	620.575	32276.578	SS-1	10/1/99				
Total HpCDD	12/19	5028.616	284578.851	SS-3	10/1/99				
Total TCDF	10/19	11.656	161.032	SS-1	10/1/99				
Total PeCDF	12/19	137.43	4190.273	SS-3	10/1/99				
Total HxCDF	12/19	399.813	28013.038	SS-1	10/1/99				
Total HpCDF	12/19	1633.143	38055.153	SS-3	10/1/99				
2,3,7,8-TCDD equivalent (TEQ-WHO)	24/24	28.7613568	6444.16891	SS-3	10/1/99	3.9	24	27	24

Notes:

PAH - polyaromatic hydrocarbons

PRG - EPA Region IX Preliminary Remediation Goal

Total PAH is the calculated sum of detected PAHs, exclusive of 2-methynaphthalene

Total TEQ (WHO 1998) was calculated using detected PCDD/PCDF results

Table 8-2. Summary of Subsurface Soil Results

Analyte	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected	Date of maximum detected result	Depth of maximum detected result (ft)	Soil PRG - Residential	Num Greater than Residential PRG	Soil PRG - Industrial	Num Greater than Industrial PRG
Conventionals (units as noted)										
Carbon, Total Organic (TOC) (%)	7/7	0.07	0.12	SB-02	10/6/99	17.5-22.5				
Solids, Total (%)	148/148	72.9	97.5	SB-62	9/6/02	14-16				
Petroleum Hydrocarbons (mg/Kg)										
Diesel fuel	2/7	170	17000	SB-06	10/5/99	15				
Diesel Range Organics	61/121	4.5	45000	MW-13	8/28/02	32-34	2000			
Heavy Fuel Oil #6	0/7	na	na							
Jet Fuel as Jet A	0/7	na	na							
Kerosene	0/7	na	na							
Lube Oil (Motor)	0/7	na	na							
Mineral Spirits	0/7	na	na							
Non-PHC as Diesel	0/7	na	na							
Oil Range Organics	20/39	40	1600	SB-25	12/12/00	28-32				
PHC as Diesel	0/7	na	na							
Residual Range Organics (RRO)	32/82	6.3	5300	SB-57	8/20/02	4-6				
Semi-volatile organic compounds (mg/Kg)										
1,2,4-Trichlorobenzene	0/3	na	na							
1,2-Dichlorobenzene	0/3	na	na							
1,3-Dichlorobenzene	0/3	na	na							
1,4-Dichlorobenzene	0/3	na	na							
2,4,5-Trichlorophenol	0/85	na	na				6100	na	62000	na
2,4,6-Trichlorophenol	0/112	na	na				6.1	na	62	na
2,4-Dichlorophenol	0/3	na	na				180	na	1800	na
2,4-Dimethylphenol	0/3	na	na							
2,4-Dinitrophenol	0/3	na	na							
2,4-Dinitrotoluene	0/3	na	na							
2,6-Dinitrotoluene	0/3	na	na							
2-Chloronaphthalene	0/3	na	na							
2-Chlorophenol	0/3	na	na							
2-Methylnaphthalene	37/79	0.00028	170	SB-39	8/26/02	10-12				
2-Methylphenol	0/3	na	na							
2-Nitroaniline	0/3	na	na							
2-Nitrophenol	0/3	na	na							
3,3'-Dichlorobenzidine	0/3	na	na							
3,4-Dichlorophenol	1/82	0.0047	0.0047	SB-36	8/23/02	14-16				

Table 8-2. Summary of Subsurface Soil Results (Continued)

Analyte	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected	Date of maximum detected result	Depth of maximum detected result (ft)	Soil PRG - Residential	Num Greater than Residential PRG	Soil PRG - Industrial	Num Greater than Industrial PRG
3,5-Dichlorophenol	0/82	na	na							
3-Nitroaniline	0/3	na	na							
4,6-Dinitro-2-methylphenol	0/3	na	na							
4-Bromophenylphenyl ether	0/3	na	na							
4-Chloro-3-methylphenol	0/3	na	na							
4-Chloroaniline	0/3	na	na							
4-Chlorophenylphenyl ether	0/3	na	na							
4-Methylphenol	0/3	na	na							
4-Nitroaniline	0/3	na	na							
4-Nitrophenol	0/3	na	na							
Acenaphthene	28/81	0.00024	210	SB-39	8/26/02	10-12	3700	0	29000	0
Acenaphthylene	19/81	0.00018	2.9	SB-39	8/26/02	10-12				
Aniline	0/3	na	na							
Anthracene	28/81	0.00024	95	SB-39	8/26/02	10-12	22000	0	100000	0
Benzidine	0/3	na	na							
Benzo(a)anthracene	27/81	0.0002	29	SB-39	8/26/02	10-12	0.62	7	2.1	5
Benzo(a)pyrene	25/81	0.00026	14	SB-39	8/26/02	10-12	0.062	9	0.21	7
Benzo(b)fluoranthene	39/81	0.00017	12	SB-39	8/26/02	10-12	0.62	6	2.1	3
Benzo(ghi)perylene	25/81	0.00012	3.9	SB-39	8/26/02	10-12				
Benzo(k)fluoranthene	25/81	0.00024	14	SB-39	8/26/02	10-12	6.2	1	21	0
Benzoic acid	0/3	na	na							
Benzyl alcohol	0/3	na	na							
bis(2-Chloroethoxy)methane	0/3	na	na							
bis(2-Chloroethyl)ether	0/3	na	na							
bis(2-Chloroisopropyl)ether	0/3	na	na							
bis(2-Ethylhexyl)phthalate	0/3	na	na							
Butylbenzylphthalate	0/3	na	na							
Carbazole	0/4	na	na							
Chrysene	38/81	0.00018	29	SB-39	8/26/02	10-12	62	0	210	0
Dibenzo(a,h)anthracene	19/81	0.00028	1.2	SB-39	8/26/02	10-12	0.062	6	0.21	5
Dibenzofuran	6/11	0.012	21	SB-25	12/12/00	28-32				
Diethylphthalate	0/3	na	na							
Dimethylphthalate	0/3	na	na							
Di-n-butylphthalate	0/3	na	na							

Table 8-2. Summary of Subsurface Soil Results (Continued)

Analyte	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected	Date of maximum detected result	Depth of maximum detected result (ft)	Soil PRG - Residential	Num Greater than Residential PRG	Soil PRG - Industrial	Num Greater than Industrial PRG
Di-n-octylphthalate	0/3	na	na							
Fluoranthene	33/81	0.00022	180	SB-39	8/26/02	10-12	2300	0	22000	0
Fluorene	34/81	0.0002	190	SB-39	8/26/02	10-12	2700	0	26000	0
Hexachlorobenzene	0/3	na	na							
Hexachlorobutadiene	0/3	na	na							
Hexachlorocyclopentadiene	0/3	na	na							
Hexachloroethane	0/3	na	na							
Indeno(1,2,3-c,d)pyrene	27/81	0.00019	5.8	SB-39	8/26/02	10-12	0.62	5	2.1	1
Isophorone	0/3	na	na							
Naphthalene	37/81	0.00022	68	SB-06	10/5/99	15	56	1	190	0
Nitrobenzene	0/3	na	na							
N-Nitrosodimethylamine	0/3	na	na							
N-Nitroso-di-n-propylamine	0/3	na	na							
N-Nitrosodiphenylamine	0/3	na	na							
Pentachlorophenol (PCP)	106/151	0.001	1400	SB-25	12/12/00	28-32	3	30	9	26
Phenanthrene	50/81	0.00021	450	SB-39	8/26/02	10-12				
Phenol	0/3	na	na							
Pyrene	42/81	0.00014	130	SB-39	8/26/02	10-12	2300	0	29000	0
Tetrachlorophenols, Total	7/122	0.01	390	SB-39	8/26/02	10-12				
Total PAHs (calculated)	68/81	0.00017	1372.2	SB-39	8/26/02	10-12				
Dioxins/Furans (pg/g)										
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0/3	na	na							
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	1/3	282000	282	SB-21	12/11/00	28-32				
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	1/3	981000	981	SB-21	12/11/00	28-32				
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	2/3	2525126	80870	SB-21	12/11/00	28-32				
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1/3	6610000	6610	SB-21	12/11/00	28-32				
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	3/3	3762357	1402220	SB-21	12/11/00	28-32				
Octachlorodibenzo-p-dioxin	3/3	36606535	4789890	SB-21	12/11/00	28-32				
2,3,7,8-Tetrachlorodibenzofuran	1/3	1350000	1350	SB-21	12/11/00	28-32				
1,2,3,7,8-Pentachlorodibenzofuran	0/3	na	na	SB-21	12/11/00	28-32				
2,3,4,7,8-Pentachlorodibenzofuran	1/3	4780000	4780	SB-21	12/11/00	28-32				
1,2,3,4,7,8-Hexachlorodibenzofuran	2/3	5832580	15940	SB-21	12/11/00	28-32				
1,2,3,6,7,8-Hexachlorodibenzofuran	1/3	4220000	4220	SB-21	12/11/00	28-32				
1,2,3,7,8,9-Hexachlorodibenzofuran	0/3	na	na	SB-21	12/11/00	28-32				

Table 8-2. Summary of Subsurface Soil Results (Continued)

Analyte	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected	Date of maximum detected result	Depth of maximum detected result (ft)	Soil PRG - Residential	Num Greater than Residential PRG	Soil PRG - Industrial	Num Greater than Industrial PRG
2,3,4,6,7,8-Hexachlorodibenzofuran	1/3	8680	8680	SB-21	12/11/00	28-32				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	3/3	330.047	141550	SB-21	12/11/00	28-32				
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1/3	8110	8110	SB-21	12/11/00	28-32				
Octachlorodibenzofuran	3/3	1470.589	376520	SB-21	12/11/00	28-32				
Total TCDD	1/3	1500	1500	SB-21	12/11/00	28-32				
Total PeCDD	1/3	4410	4410	SB-21	12/11/00	28-32				
Total HxCDD	1/3	219400	219400	SB-21	12/11/00	28-32				
Total HpCDD	3/3	6646.418	2664250	SB-21	12/11/00	28-32				
Total TCDF	1/3	7150	7150	SB-21	12/11/00	28-32				
Total PeCDF	1/3	56680	56680	SB-21	12/11/00	28-32				
Total HxCDF	3/3	71.695	395790	SB-21	12/11/00	28-32				
Total HpCDF	2/3	30131.894	685620	SB-21	12/11/00	28-32				
2,3,7,8-TCDD equivalent (TEQ-WHO)	3/3	44.7	14600	SB-21	12/11/00	28-32	3.9	3	27	3

Notes:

PAH - polycyclic aromatic hydrocarbons

PRG - EPA Region IX Preliminary Remediation Goal

Total PAH is the calculated sum of detected PAHs, exclusive of 2-methylnaphthalene

Total TEQ (WHO 1998) was calculated using detected PCDD/PCDF results

Table 8-3. Summary of Sediment Results

Analyte	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	Soil PRG - Residential	Num Greater than Residential PRG	Soil PRG - Industrial	Num Greater than Industrial PRG
Conventionals (units as noted)									
Carbon, Total Organic (TOC) (%)	6/6	1.19	3.77	D6	8/15/02				
pH	6/6	5.36	7	D7	8/15/02				
Solids, Total (%)	6/6	50.3	88	D2	8/15/02				
Petroleum Hydrocarbons (mg/Kg)									
Diesel Range Organics	6/6	140	2100	D6	8/15/02				
Residual Range Organics (RRO)	6/6	550	8900	D6	8/15/02				
Semi-volatile organic compounds (mg/Kg)									
2,4,5-Trichlorophenol	0/6	na	na			6100	na	62000	na
2,4,6-Trichlorophenol	0/6	na	na			6.1	na	62	na
3,4-Dichlorophenol	2/6	0.98	2	D6	8/15/02				
3,5-Dichlorophenol	0/6	na	na						
Pentachlorophenol (PCP)	6/6	1.6	11	D5	8/15/02	3	2	9	2
Tetrachlorophenols, Total	2/6	0.087	0.12	D6	8/15/02				

Notes:

PAH - polyaromatic hydrocarbons

PRG - EPA Region IX Preliminary Remediation Goal

Total PAH is the calculated sum of detected PAHs, exclusive of 2-methynaphthalene

Total TEQ (WHO 1998) was calculated using detected PCDD/PCDF results

Table 8-4. Summary of Vadose Zone Pore Water Results

Analyte	CHEMCODE	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
Metals									
Copper	COPPER	mg/L	6/20	0.0007	0.0021	L-2	11/6/03		
Petroleum Hydrocarbons									
Diesel Range Organics	DIESEL_O	ug/L	3/52	270	530	L-1	3/28/01		
Oil Range Organics	OIL_O	ug/L	0/9	na	na				
Residual Range Organics (RRO)	RESIDUAL_O	ug/L	0/43	na	na				
Semi-volatile organic compounds									
2,3,4,5-Tetrachlorophenol	CLPHN2345	ug/L	0/3	na	na			3600	
2,3,5,6-Tetrachlorophenol	CLPHN2356	ug/L	0/3	na	na			3.6	
Pentachlorophenol (PCP)	CLPHN5	ug/L	9/55	0.069	27	L-1	1/16/01	0.56	4
Tetrachlorophenols, Total	CLPHENOL4	ug/L	0/3	na	na				
Dioxins/Furans									
2,3,7,8-Tetrachlorodibenzo-p-dioxin	PCD2378	pg/L	2/54	6.3	6.3	L-1/L-3	4/10/02		
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	PCD12378	pg/L	3/54	1.1	8.3	L-1/L-3	4/10/02		
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	PCD123478	pg/L	3/54	2.8	9.3	L-1/L-3	4/10/02		
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	PCD123678	pg/L	5/54	0.85	24.526	L-1	11/6/03		
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	PCD123789	pg/L	6/54	0.84	8.9	L-1/L-3	4/10/02		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	PCD1234678	pg/L	16/54	2.288	932.658	L-1	11/6/03		
Octachlorodibenzo-p-dioxin	PCD_OCT	pg/L	21/54	8.498	3354.235	L-1	11/6/03		
2,3,7,8-Tetrachlorodibenzofuran	PCF2378	pg/L	4/54	2.9	7.8	L-1	3/28/01		
1,2,3,7,8-Pentachlorodibenzofuran	PCF12378	pg/L	5/54	2.4	9.1	L-3	3/28/01		
2,3,4,7,8-Pentachlorodibenzofuran	PCF23478	pg/L	4/54	2.9	4.5	L-1/L-3	4/10/02		
1,2,3,4,7,8-Hexachlorodibenzofuran	PCF123478	pg/L	8/54	0.77	8.2	L-3	4/10/02		
1,2,3,6,7,8-Hexachlorodibenzofuran	PCF123678	pg/L	6/54	0.38	5.5	L-1/L-3	4/10/02		
1,2,3,7,8,9-Hexachlorodibenzofuran	PCF123789	pg/L	4/54	5	8.7	L-1/L-3	4/10/02		
2,3,4,6,7,8-Hexachlorodibenzofuran	PCF234678	pg/L	6/54	0.43	5.8	L-1/L-3	4/10/02		
1,2,3,4,6,7,8-Heptachlorodibenzofuran	PCF1234678	pg/L	6/54	2.1	43.975	L-1	11/6/03		
1,2,3,4,7,8,9-Heptachlorodibenzofuran	PCF1234789	pg/L	4/54	3.6	8.2	L-1/L-3	4/10/02		
Octachlorodibenzofuran	PCF_OCT	pg/L	16/54	4.6	421.895	L-1	11/6/03		
Total TCDD	PCDD_T4	pg/L	2/54	6.3	6.3	L-1/L-3	4/10/02		
Total PeCDD	PCDD_T5	pg/L	3/54	1.1	8.3	L-1/L-3	4/10/02		
Total HxCDD	PCDD_T6	pg/L	11/54	0.53	121.467	L-1	11/6/03		
Total HpCDD	PCDD_T7	pg/L	26/54	1.95	1495.892	L-1	11/6/03		

Table 8-4. Summary of Vadose Zone Pore Water Results (Continued)

Analyte	CHEMCODE	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
Total TCDF	PCDF_T4	pg/L	7/54	2.278	60.2	L-1	3/28/01		
Total PeCDF	PCDF_T5	pg/L	7/54	2.4	13.2	L-3	3/28/01		
Total HxCDF	PCDF_T6	pg/L	15/54	1.9	30.46	L-1	11/6/03		
Total HpCDF	PCDF_T7	pg/L	16/54	0.812	287.847	L-1	11/6/03		
2,3,7,8-TCDD equivalent (TEQ-WHO)	TEQ_WHO	pg/L	17/61	0.0006	22.5276	L-3	4/10/02	0.45	8

Notes:

PAH - polyaromatic hydrocarbons

PRG - EPA Region IX Preliminary Remediation Goal

Total PAH is the calculated sum of detected PAHs, exclusive of 2-methynaphthalene

Total TEQ (WHO 1998) was calculated using detected PCDD/PCDF results

Table 8-5. Summary of Groundwater Results

Analyte	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
Conventionals								
Alkalinity	mg/L	111/111	27	519	BXS-3	8/6/97		
Alkalinity, Total as CaCO ₃	mg/L	125/125	31	503	BXS-2	10/5/00		
Ammonia as Nitrogen	mg/L	117/222	0.006	1.3	BXS-4	8/13/88		
Bicarbonate as CaCO ₃	mg/L	124/124	31	503	BXS-2	10/5/00		
Carbon, Total Organic (TOC)	mg/L	349/358	0.6	91	BXS-4	3/28/89		
Chemical Oxygen Demand (COD)	mg/L	239/251	0.4	1857	BXS-4	8/13/88		
Chloride	mg/L	420/421	0.8	134	MW-10	9/29/03		
Coliform, Total	MPN/100 mL	122/257	1	2400	BXS-1/BXS-3	8/13/88		
Conductivity	mg/L	10/10	192	887	BXS-3	10/9/01		
Conductivity	uMHOS/cm	534/534	17	7103	BXS-2	4/9/97		
Dissolved Bicarbonate	mg/L	111/111	27	519	BXS-3	8/6/97		
Dissolved Oxygen	mg/L	183/183	0	8.6	MW-2	1/13/97		
Fecal Coliform	MPN/100 mL	0/10	na	na				
Fluoride	mg/L	1/47	0.2	0.2	BXS-4	1/10/95		
Nitrate as Nitrogen	mg/L	15/50	0.003	1.4	BXS-1	6/15/89		
Nitrite as Nitrogen	mg/L	5/50	0.004	0.2	BXS-3	10/9/01		
Nitrate+Nitrite as Nitrogen	mg/L	71/208	0.01	4.8	MW-10	10/25/02		
pH	PH	547/547	4.6	9.61	MW-3	4/17/96		
Solids, Total Suspended (TSS)	mg/L	95/193	5	106000	SB-09	12/8/00		
Sulfate	mg/L	305/343	0.14	26.1	MW-2	4/18/00		
Sulfide	mg/L	29/31	0.8	21.1	MW-2	7/21/99		
Tannin and Lignin	mg/L	219/248	0.1	30.4	BXS-4	1/14/98		
Temperature	C	291/291	8	21.3	BXS-2	8/13/88		
Total dissolved solids	mg/L	227/227	94	624	BXS-3	9/25/96		
Metals								
Antimony, Total	mg/L	0/2	na	na				
Arsenic	mg/L	0/2	na	na				
Barium, Total	mg/L	2/2	0.0063	0.0084	MW-10	1/21/03		
Beryllium, Total	mg/L	0/2	na	na				
Cadmium, total	mg/L	0/2	na	na				
Chromium	mg/L	0/2	na	na				
Cobalt, Total	mg/L	0/2	na	na				
Copper	mg/L	7/52	0.0044	0.0214	MW-3	4/10/03		
Cyanide, Total	mg/L	0/2	na	na				

Table 8-5. Summary of Groundwater Results (Continued)

Analyte	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
Iron, Total	mg/L	39/50	0.0045	4.74	BXS-3	1/16/03		
Lead	mg/L	0/2	na	na				
Mercury, Total	mg/L	0/2	na	na				
Nickel	mg/L	0/2	na	na				
Selenium, Total	mg/L	0/2	na	na				
Silver, Total	mg/L	0/2	na	na				
Thallium, Total	mg/L	0/2	na	na				
Tin	mg/L	0/2	na	na				
Vanadium, Total	mg/L	0/2	na	na				
Zinc, Total	mg/L	2/2	0.0021	0.0029	MW-3	1/21/03		
Dissolved Metals								
Arsenic, Dissolved	mg/L	76/228	0.001	0.052	BXS-3	1/11/00		
Barium, Dissolved	mg/L	225/228	0.008	0.129	BXS-3	7/11/02		
Cadmium, Dissolved	mg/L	9/228	0.0005	0.009	BXS-1	3/24/92		
Calcium, Dissolved	mg/L	346/346	0.0107	112	BXS-3	4/4/01		
Chromium, Dissolved	mg/L	1/48	0.018	0.018	BXS-4	9/25/92		
Copper, Dissolved	mg/L	12/228	0.005	0.027	BXS-4	4/13/99		
Iron, Dissolved	mg/L	276/499	0.0063	56.6	BXS-3	4/20/00		
Lead, Dissolved	mg/L	1/48	0.003	0.003	BXS-3	6/22/93		
Magnesium, Dissolved	mg/L	355/355	0.00624	71.2	BXS-2	4/4/01		
Manganese, Dissolved	mg/L	323/368	0.0085	18.2	BXS-3	7/12/04		
Mercury, Dissolved	mg/L	0/48	na	na				
Nickel, Dissolved	mg/L	97/220	0.0148	0.055	BXS-2	1/12/99		
Potassium, Dissolved	mg/L	242/321	0.0021	12.3	BXS-3	4/11/02		
Selenium, Dissolved	mg/L	1/48	0.007	0.007	BXS-1	3/22/94		
Silver, Dissolved	mg/L	0/48	na	na				
Sodium, Dissolved	mg/L	356/356	0.00434	73.4	HCMW-5	10/13/04		
Zinc, Dissolved	mg/L	76/248	0.004	0.062	BXS-3	1/10/95		
Petroleum Hydrocarbons								
Diesel fuel	ug/L	0/7	na	na				
Diesel Range Organics	ug/L	29/68	54	3700	MW-13	10/25/02		
Gasoline	ug/L	0/4	na	na				
Heavy Fuel Oil #6	ug/L	0/7	na	na				
Jet Fuel as Jet A	ug/L	0/7	na	na				
Kerosene	ug/L	0/7	na	na				

Table 8-5. Summary of Groundwater Results (Continued)

Analyte	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
Lube Oil (Motor)	ug/L	0/7	na	na				
Mineral Spirits	ug/L	0/7	na	na				
Non-PHC as Diesel	ug/L	3/7	70	89	SB-04	10/6/99		
Non-PHC as Gasoline	ug/L	0/4	na	na				
PHC as Diesel	ug/L	0/7	na	na				
PHC as Gasoline	ug/L	0/4	na	na				
Residual Range Organics (RRO)	ug/L	1/68	66	66	MW-13	10/25/02		
Pesticides & Aroclors								
2,4,5-T	ug/L	0/3	na	na				
2,4,5-TP (Silvex)	ug/L	0/3	na	na				
2,4-D	ug/L	0/3	na	na				
4,4'-DDD	ug/L	0/2	na	na				
4,4'-DDE	ug/L	0/2	na	na				
4,4'-DDT	ug/L	0/2	na	na				
a-BHC	ug/L	0/2	na	na				
Aldrin	ug/L	0/2	na	na				
alpha-Chlordane	ug/L	0/2	na	na				
Aramite, Total	ug/L	0/3	na	na				
beta-BHC	ug/L	0/2	na	na				
delta-BHC	ug/L	0/2	na	na				
Dieldrin	ug/L	0/2	na	na				
Dimethoate	ug/L	0/3	na	na				
Disulfoton	ug/L	0/3	na	na				
Endosulfan I	ug/L	0/2	na	na				
Endosulfan II	ug/L	0/2	na	na				
Endosulfan Sulfate	ug/L	0/2	na	na				
Endrin	ug/L	0/2	na	na				
Endrin Aldehyde	ug/L	0/2	na	na				
Famphur	ug/L	0/3	na	na				
gamma-Chlordane	ug/L	0/2	na	na				
gamma-BHC, Lindane	ug/L	0/2	na	na				
Heptachlor	ug/L	0/2	na	na				
Heptachlor Epoxide	ug/L	0/2	na	na				
Methoxychlor	ug/L	0/2	na	na				
Methyl Parathion	ug/L	0/3	na	na				

Table 8-5. Summary of Groundwater Results (Continued)

Analyte	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
Parathion	ug/L	0/3	na	na				
Phorate	ug/L	0/3	na	na				
Sulfotep	ug/L	0/3	na	na				
Thionazin	ug/L	0/3	na	na				
Toxaphene	ug/L	0/2	na	na				
Aroclor 1016	ug/L	0/2	na	na				
Aroclor 1221	ug/L	0/2	na	na				
Aroclor 1232	ug/L	0/2	na	na				
Aroclor 1242	ug/L	0/2	na	na				
Aroclor 1248	ug/L	0/2	na	na				
Aroclor 1254	ug/L	0/2	na	na				
Aroclor 1260	ug/L	0/2	na	na				
Semi-volatile organic compounds								
1,2-Dichlorobenzene	ug/L	0/16	na	na				
1,2,4-Trichlorobenzene	ug/L	0/16	na	na				
1,2,4,5-Tetrachlorobenzene	ug/L	0/3	na	na				
1,3-Dichlorobenzene	ug/L	0/16	na	na				
1,3-Dinitrobenzene	ug/L	0/3	na	na				
1,3,5-Trinitrobenzene	ug/L	0/3	na	na				
1,4-Dichlorobenzene	ug/L	0/16	na	na				
1,4-Naphthoquinone	ug/L	0/3	na	na				
1,4-Phenylenediamine	ug/L	0/3	na	na				
1-Naphthylamine	ug/L	0/3	na	na				
2,3,4,5-Tetrachlorophenol	ug/L	0/3	na	na				
2,3,4,6-Tetrachlorophenol	ug/L	1/3	43	43	MW-3	10/25/02		
2,3,5,6-Tetrachlorophenol	ug/L	2/3	12	110	MW-3	4/10/03		
2,4-Dichlorophenol	ug/L	0/111	na	na				
2,4-Dimethylphenol	ug/L	0/111	na	na				
2,4-Dinitrophenol	ug/L	0/111	na	na				
2,4-Dinitrotoluene	ug/L	0/11	na	na				
2,4,5-Trichlorophenol	ug/L	0/126	na	na				
2,4,6-Trichlorophenol	ug/L	1/237	0.24	0.24	HCMW-7	10/24/02		
2,6-Dichlorophenol	ug/L	0/3	na	na				
2,6-Dinitrotoluene	ug/L	0/11	na	na				
2-Acetylaminofluorene	ug/L	0/3	na	na				

Table 8-5. Summary of Groundwater Results (Continued)

Analyte	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
2-Chloronaphthalene	ug/L	0/11	na	na				
2-Chlorophenol	ug/L	0/111	na	na				
2-Methyl-5-nitroaniline (5-Nitro-o-toluidine)	ug/L	0/3	na	na				
2-Methylnaphthalene	ug/L	45/82	0.0028	1.3	MW-3	7/21/03		
2-Methylphenol (o-Cresol)	ug/L	0/11	na	na				
2-Naphthylamine	ug/L	0/3	na	na				
2-Nitroaniline	ug/L	0/11	na	na				
2-Nitrophenol	ug/L	0/111	na	na				
2-Picoline	ug/L	0/3	na	na				
3,3'-Dichlorobenzidine	ug/L	0/11	na	na				
3,3'-Dimethylbenzidine	ug/L	0/3	na	na				
3,4-Dichlorophenol	ug/L	0/115	na	na				
3,5-Dichlorophenol	ug/L	0/115	na	na				
3-Methylcholanthrene	ug/L	0/3	na	na				
3-Nitroaniline	ug/L	0/11	na	na				
4,6-Dinitro-2-methylphenol	ug/L	0/111	na	na				
4-Aminobiphenyl	ug/L	0/3	na	na				
4-Bromophenylphenyl ether	ug/L	0/11	na	na				
4-Chloro-3-methylphenol	ug/L	0/111	na	na				
4-Chloroaniline	ug/L	0/11	na	na				
4-Chlorophenylphenyl ether	ug/L	0/11	na	na				
4-Methylphenol	ug/L	0/11	na	na				
4-Nitroaniline	ug/L	0/11	na	na				
4-Nitrophenol	ug/L	0/111	na	na				
4-Nitroquinoline N-Oxide	ug/L	0/3	na	na				
7,12-Dimethylbenz(a)anthracene	ug/L	0/3	na	na				
a,a-Dimethylphenethylamine	ug/L	0/3	na	na				
Acenaphthene	ug/L	13/182	0.0021	9.6	MW-13	10/25/02		
Acenaphthylene	ug/L	13/182	0.002	1	BXS-3	1/12/99		
Acetophenone	ug/L	0/3	na	na				
Aniline	ug/L	0/11	na	na				
Anthracene	ug/L	20/182	0.0012	1.2	MW-13	10/25/02		
Benzidine	ug/L	0/8	na	na				
Benzo(a)anthracene	ug/L	12/182	0.0025	0.1	MW-13	10/25/02	0.092	1
Benzo(a)pyrene	ug/L	15/182	0.0016	0.69	MW-3	10/25/02	0.0092	3

Table 8-5. Summary of Groundwater Results (Continued)

Analyte	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
Benzo(b)fluoranthene	ug/L	19/182	0.002	0.8	BXS-4	10/5/99	0.092	4
Benzo(ghi)perylene	ug/L	17/182	0.0035	0.017	MW-3	4/10/03		
Benzo(k)fluoranthene	ug/L	14/182	0.0015	0.018	MW-13	10/25/02		
Benzoic acid	ug/L	0/11	na	na				
Benzyl alcohol	ug/L	0/11	na	na				
bis(2-Chloroethoxy)methane	ug/L	0/11	na	na				
bis(2-Chloroethyl)ether	ug/L	0/11	na	na				
Bis(2-chloroisopropyl)ether	ug/L	0/11	na	na				
bis(2-Ethylhexyl)phthalate	ug/L	0/11	na	na				
Butylbenzylphthalate	ug/L	0/11	na	na				
Chlorobenzilate	ug/L	0/3	na	na				
Chrysene	ug/L	8/182	0.0015	0.1	MW-13	10/25/02		
Diallate	ug/L	0/3	na	na				
Dibenzo(a,h)anthracene	ug/L	18/182	0.0019	0.015	MW-3	4/10/03	0.0092	2
Dibenzofuran	ug/L	0/31	na	na				
Diethylphthalate	ug/L	0/11	na	na				
Dimethylphthalate	ug/L	0/11	na	na				
Di-n-butylphthalate	ug/L	0/11	na	na				
Di-n-octylphthalate	ug/L	0/11	na	na				
Dinoseb	ug/L	0/3	na	na				
Diphenylamine	ug/L	0/3	na	na				
Ethyl Methanesulfonate	ug/L	0/3	na	na				
Fluoranthene	ug/L	12/182	0.0029	0.77	MW-13	10/25/02		
Fluorene	ug/L	21/182	0.0026	8.7	MW-13	10/25/02		
Hexachlorobenzene	ug/L	0/11	na	na				
Hexachlorobutadiene	ug/L	0/16	na	na				
Hexachlorocyclopentadiene	ug/L	0/11	na	na				
Hexachloroethane	ug/L	0/11	na	na				
Hexachlorophene	ug/L	0/3	na	na				
Hexachloropropene	ug/L	0/3	na	na				
Indeno(1,2,3-cd)pyrene	ug/L	14/182	0.0023	0.012	MW-3	4/10/03		
Isodrin	ug/L	0/3	na	na				
Isophorone	ug/L	0/11	na	na				
Isosafrole	ug/L	0/3	na	na				
Kepone	ug/L	0/3	na	na				

Table 8-5. Summary of Groundwater Results (Continued)

Analyte	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
Methapyrilene	ug/L	0/3	na	na				
Methyl Methanesulfonate	ug/L	0/3	na	na				
Naphthalene	ug/L	47/187	0.0037	5.4	MW-3	7/21/03		
Nitrobenzene	ug/L	0/11	na	na				
N-Nitrosodiethylamine	ug/L	0/3	na	na				
N-Nitrosodimethylamine	ug/L	0/11	na	na				
N-Nitroso-di-n-butylamine	ug/L	0/3	na	na				
N-Nitroso-di-n-propylamine	ug/L	0/11	na	na				
N-Nitrosodiphenylamine	ug/L	0/11	na	na				
N-Nitrosomethylethylamine	ug/L	0/3	na	na				
N-Nitrosomorpholine	ug/L	0/3	na	na				
N-Nitrosopiperidine	ug/L	0/3	na	na				
N-Nitrosopyrrolidine	ug/L	0/3	na	na				
O,O,O-Triethyl Phosphorothioate	ug/L	0/3	na	na				
o-Toluidine	ug/L	0/3	na	na				
p-Dimethylaminoazobenzene	ug/L	0/3	na	na				
Pentachlorobenzene	ug/L	0/3	na	na				
Pentachloroethane	ug/L	0/3	na	na				
Pentachloronitrobenzene (PCNB)	ug/L	0/3	na	na				
Pentachlorophenol (PCP)	ug/L	205/398	0.067	19000	MW-13	10/25/02	0.56	181
Phenacetin	ug/L	0/3	na	na				
Phenanthrene	ug/L	20/182	0.0035	4.7	MW-13	10/25/02		
Phenol	ug/L	0/111	na	na				
Pronamide	ug/L	0/3	na	na				
Pyrene	ug/L	12/182	0.003	0.61	MW-13	10/25/02		
Pyridine	ug/L	0/3	na	na				
Safrole	ug/L	0/3	na	na				
Styrene	ug/L	0/5	na	na				
Tetrachlorophenols, Total	ug/L	19/123	0.1	140	MW-3	7/21/03		
Total PAHs (calculated)	ug/L	71/182	0.0013	26.4045	MW-13	10/25/02		
Total Phenols	ug/L	3/4	0.2	300	BXS-4	4/17/96		
Volatile organic compounds								
1,1,1,2-Tetrachloroethane	ug/L	0/5	na	na				
1,1,1-Trichloroethane	ug/L	0/5	na	na				
1,1,2,2-Tetrachloroethane	ug/L	0/5	na	na				

Table 8-5. Summary of Groundwater Results (Continued)

Analyte	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
1,1,2-Trichloroethane	ug/L	0/5	na	na				
1,1-Dichloroethane	ug/L	0/5	na	na				
1,1-Dichloroethene	ug/L	0/5	na	na				
1,2,3-Trichloropropane	ug/L	0/5	na	na				
1,2-Dibromo-3-chloropropane (DBCP)	ug/L	0/5	na	na				
1,2-Dibromoethane	ug/L	0/5	na	na				
1,2-Dichloroethane	ug/L	0/5	na	na				
1,2-Dichloropropane	ug/L	0/5	na	na				
1,4-Dioxane	ug/L	0/5	na	na				
2-Butanone (MEK)	ug/L	0/5	na	na				
2-Chloro-1,3-butadiene (Chloroprene)	ug/L	0/5	na	na				
2-Hexanone	ug/L	0/5	na	na				
2-Methyl-1-propanol (Isobutyl Alcohol)	ug/L	0/5	na	na				
3-Chloro-1-propene	ug/L	0/5	na	na				
4-Methyl-2-pentanone (MIBK)	ug/L	0/5	na	na				
Acetone	ug/L	0/5	na	na				
Acetonitrile	ug/L	0/5	na	na				
Acrolein	ug/L	0/5	na	na				
Acrylonitrile	ug/L	0/5	na	na				
Benzene	ug/L	0/9	na	na				
Bromodichloromethane	ug/L	0/5	na	na				
Bromoform	ug/L	0/5	na	na				
Bromomethane (Methyl bromide)	ug/L	0/5	na	na				
Carbon disulfide	ug/L	0/5	na	na				
Carbon tetrachloride	ug/L	0/5	na	na				
Chlorobenzene	ug/L	0/5	na	na				
Chloroethane	ug/L	0/5	na	na				
Chloroform	ug/L	0/5	na	na				
Chloromethane	ug/L	0/5	na	na				
cis-1,3-Dichloropropene	ug/L	0/5	na	na				
cis-1,4-Dichloro-2-butene	ug/L	0/5	na	na				
Dibromochloromethane	ug/L	0/5	na	na				
Dibromomethane	ug/L	0/5	na	na				
Dichlorodifluoromethane (CFC 12)	ug/L	0/5	na	na				
Ethyl Methacrylate	ug/L	0/5	na	na				

Table 8-5. Summary of Groundwater Results (Continued)

Analyte	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
Ethylbenzene	ug/L	0/9	na	na				
Iodomethane	ug/L	0/5	na	na				
m & p Xylene	ug/L	1/5	0.22	0.22	MW-3	1/21/03		
Methacrylonitrile	ug/L	0/5	na	na				
Methyl Methacrylate	ug/L	0/5	na	na				
Methylene chloride (Dichloromethane)	ug/L	0/5	na	na				
Methyl-t-butyl ether	ug/L	0/5	na	na				
o-Xylene	ug/L	2/5	0.08	0.1	MW-10	1/21/03		
Propionitrile	ug/L	0/5	na	na				
Tetrachloroethene	ug/L	0/5	na	na				
Toluene	ug/L	0/9	na	na				
trans-1,2-Dichloroethene	ug/L	0/5	na	na				
trans-1,3-Dichloropropene	ug/L	0/5	na	na				
trans-1,4-Dichloro-2-butene	ug/L	0/5	na	na				
Trichloroethene	ug/L	0/5	na	na				
Trichlorofluoromethane	ug/L	1/5	1.3	1.3	MW-3	1/21/03		
Vinyl acetate	ug/L	0/5	na	na				
Vinyl chloride	ug/L	0/5	na	na				
Xylenes, Total	ug/L	0/4	na	na				
Dioxins/Furans								
2,3,7,8-Tetrachlorodibenzo-p-dioxin	pg/L	11/107	1.6	6.3	MW-2	4/10/02		
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	pg/L	14/107	0.93	103.196	MW-2	10/4/99		
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	pg/L	20/107	1	262.243	MW-2	10/4/99		
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	pg/L	22/107	2.2	781.167	MW-2	10/4/99		
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	pg/L	18/107	2.4	569.969	MW-2	10/4/99		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	pg/L	49/107	2.29	25496.666	MW-2	10/4/99		
Octachlorodibenzo-p-dioxin	pg/L	58/107	9.624	228345.14	MW-2	10/4/99		
2,3,7,8-Tetrachlorodibenzofuran	pg/L	12/107	0.46	4.5	BXS-2	4/11/02		
1,2,3,7,8-Pentachlorodibenzofuran	pg/L	13/107	0.89	7.3	BXS-2	4/11/02		
2,3,4,7,8-Pentachlorodibenzofuran	pg/L	13/107	0.37	4.5	MW-2	4/10/02		
1,2,3,4,7,8-Hexachlorodibenzofuran	pg/L	17/107	0.55	3102.406	MW-2	10/4/99		
1,2,3,6,7,8-Hexachlorodibenzofuran	pg/L	12/107	1.2	7.2	MW-1	4/10/02		
1,2,3,7,8,9-Hexachlorodibenzofuran	pg/L	13/107	1	8.7	MW-2	4/10/02		
2,3,4,6,7,8-Hexachlorodibenzofuran	pg/L	12/107	1.3	10	MW-1	4/10/02		
1,2,3,4,6,7,8-Heptachlorodibenzofuran	pg/L	33/107	0.75	3294.053	MW-2	10/4/99		

Table 8-5. Summary of Groundwater Results (Continued)

Analyte	Units	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	GW PRG - Tapwater	Num Greater than PRG
1,2,3,4,7,8,9-Heptachlorodibenzofuran	pg/L	18/107	1.5	15.4	MW-1	4/10/02		
Octachlorodibenzofuran	pg/L	31/107	7.185	17067.186	MW-2	10/4/99		
Total TCDD	pg/L	12/107	1.6	15.804	BXS-4	2/10/04		
Total PeCDD	pg/L	16/107	1.4	249.241	MW-2	10/4/99		
Total HxCDD	pg/L	25/107	2.2	3248.586	MW-2	10/4/99		
Total HpCDD	pg/L	49/107	2.29	25496.666	MW-2	10/4/99		
Total TCDF	pg/L	24/107	0.7	35.993	MW-2	10/4/99		
Total PeCDF	pg/L	16/107	1.1	166.117	MW-2	10/4/99		
Total HxCDF	pg/L	24/107	0.901	1562.074	MW-2	10/4/99		
Total HpCDF	pg/L	37/107	1.7	4644.99	MW-2	10/4/99		
2,3,7,8-TCDD equivalent (TEQ-WHO)	pg/L	58/122	0.0007	887.22292	MW-2	10/4/99	0.45	32

Notes:

PAH - polyaromatic hydrocarbons

PRG - EPA Region IX Preliminary Remediation Goal

Total PAH is the calculated sum of detected PAHs, exclusive of 2-methynaphthalene

Total TEQ (WHO 1998) was calculated using detected PCDD/PCDF results

Table 8-6. Summary of Offsite Soil Results - Air Investigation

Analyte	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	Soil PRG - Residential	Num Greater than Residential PRG	Soil PRG - Industrial	Num Greater than Industrial PRG
Conventionals (units as noted)									
Solids, Total (%)	5/5	86.6	96.4	SS120	9/29/03				
Semi-volatile organic compounds (mg/Kg)									
1,2,4-Trimethylbenzene	0/5	na	na						
1,3,5-Trimethylbenzene	0/5	na	na						
2,4,5-Trichlorophenol	0/1	na	na			6100		62000	
2,4,6-Trichlorophenol	0/1	na	na			6.1		62	
2-Methylnaphthalene	5/5	0.0042	0.048	SS123	9/29/03				
3,4-Dichlorophenol	0/1	na	na						
3,5-Dichlorophenol	0/1	na	na						
Acenaphthene	1/5	0.0004	0.0004	SS124	9/29/03	3700		29000	
Acenaphthylene	3/5	0.00079	0.017	SS123	9/29/03				
Anthracene	3/5	0.0022	0.019	SS123	9/29/03	22000		100000	
Benzo(a)anthracene	4/5	0.0041	0.032	SS123	9/29/03	0.62		2.1	
Benzo(a)pyrene	4/5	0.0055	0.041	SS123	9/29/03	0.062		0.21	
Benzo(b)fluoranthene	4/5	0.01	0.17	SS123	9/29/03	0.62		2.1	
Benzo(ghi)perylene	4/5	0.0086	0.13	SS123	9/29/03				
Benzo(k)fluoranthene	4/5	0.0087	0.089	SS123	9/29/03	6.2		21	
Chrysene	4/5	0.013	0.18	SS123	9/29/03	62		210	
Dibenzo(a,h)anthracene	2/5	0.0013	0.015	SS123	9/29/03	0.062		0.21	
Fluoranthene	4/5	0.015	0.12	SS123	9/29/03	2300		22000	
Fluorene	2/5	0.0012	0.0047	SS123	9/29/03	2700		26000	
Indeno(1,2,3-c,d)pyrene	4/5	0.0087	0.095	SS123	9/29/03	0.62		2.1	
Naphthalene	5/5	0.0022	0.034	SS123	9/29/03	56		190	
Pentachlorophenol (PCP)	5/5	0.012	0.18	SS123	9/29/03	3		9	
Phenanthrene	4/5	0.011	0.058	SS123	9/29/03				
Pyrene	4/5	0.014	0.15	SS123	9/29/03	2300		29000	
Tetrachlorophenols, Total	0/1	na	na	SS123	9/29/03				
Total PAHs (calculated)	5/5	0.0051	1.1547	SS123	9/29/03				
Volatile organic compounds (mg/Kg)									
Benzene	0/5	na	na			0.6		1.3	
Dioxins/Furans (pg/g)									
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1/6	3.479	3.479	SS123	9/29/03				
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	5/6	0.403	42.453	SS123	9/29/03				
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	5/6	0.942	97.159	SS123	9/29/03				

Table 8-6. Summary of Offsite Soil Results - Air Investigation (Continued)

Analyte	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	Soil PRG - Residential	Num Greater than Residential PRG	Soil PRG - Industrial	Num Greater than Industrial PRG
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	5/6	3.049	252.478	SS123	9/29/03				
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	5/6	2.091	197.925	SS123	9/29/03				
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	5/6	75.811	7430.826	SS123	9/29/03				
Octachlorodibenzo-p-dioxin	5/6	572.496	64789.84	SS123	9/29/03				
2,3,7,8-Tetrachlorodibenzofuran	2/6	0.667	2.685	SS123	9/29/03				
1,2,3,7,8-Pentachlorodibenzofuran	1/6	7.188	7.188	SS123	9/29/03				
2,3,4,7,8-Pentachlorodibenzofuran	3/6	0.678	8.773	SS123	9/29/03				
1,2,3,4,7,8-Hexachlorodibenzofuran	4/6	2.056	59.324	SS123	9/29/03				
1,2,3,6,7,8-Hexachlorodibenzofuran	5/6	0.462	48.161	SS123	9/29/03				
1,2,3,7,8,9-Hexachlorodibenzofuran	0/6	na	na						
2,3,4,6,7,8-Hexachlorodibenzofuran	5/6	0.689	80.29	SS123	9/29/03				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	5/6	9.654	1548.826	SS123	9/29/03				
1,2,3,4,7,8,9-Heptachlorodibenzofuran	5/6	0.522	85.71	SS123	9/29/03				
Octachlorodibenzofuran	5/6	33.631	7974.593	SS123	9/29/03				
Total TCDD	2/6	0.994	39.646	SS123	9/29/03				
Total PeCDD	5/6	2.329	293.979	SS123	9/29/03				
Total HxCDD	5/6	31.02	2108.526	SS123	9/29/03				
Total HpCDD	5/6	170.517	14471.918	SS123	9/29/03				
Total TCDF	5/6	0.4	121.588	SS123	9/29/03				
Total PeCDF	5/6	2.224	531.065	SS123	9/29/03				
Total HxCDF	5/6	9.03	1958.592	SS123	9/29/03				
Total HpCDF	5/6	27.968	5118.307	SS123	9/29/03				
2,3,7,8-TCDD equivalent (TEQ-WHO)	6/6	0.9152627	222.41016	SS123	9/29/03	3.9	5	27	3

Notes:

PAH - polycyclic aromatic hydrocarbons

PRG - EPA Region IX Preliminary Remediation Goal

Total PAH is the calculated sum of detected PAHs, exclusive of 2-methylnaphthalene

Total TEQ (WHO 1998) was calculated using detected PCDD/PCDF results

Table 8-7. Summary of Offsite Soil Results - Air Investigation

Analyte	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	Soil PRG - Residential	Num Greater than Residential PRG	Soil PRG - Industrial	Num Greater than Industrial PRG
Conventionals (units as noted)									
Solids, Total (%)	21/21	6.7	97.8	SS107	8/14/02				
Petroleum Hydrocarbons (mg/Kg)									
Diesel Range Organics	20/21	5.3	110	SS102	8/9/02				
Residual Range Organics (RRO)	21/21	62	690	SS105	8/14/02				
Semi-volatile organic compounds (mg/Kg)									
2,4,5-Trichlorophenol	0/21	na	na			6100		62000	
2,4,6-Trichlorophenol	0/21	na	na			6.1		62	
2-Methylnaphthalene	21/21	0.00024	0.0039	SS116	8/14/02				
3,4-Dichlorophenol	0/21	na	na						
3,5-Dichlorophenol	0/21	na	na						
Acenaphthene	7/21	0.00024	0.0057	SS119	8/14/02	3700		29000	
Acenaphthylene	16/21	0.00026	0.0075	SS110	8/14/02				
Anthracene	19/21	0.00024	0.021	SS119	8/14/02	22000		100000	
Benzo(a)anthracene	21/21	0.0005	0.059	SS119	8/14/02	0.62		2.1	
Benzo(a)pyrene	21/21	0.00071	0.059	SS119	8/14/02	0.062		0.21	
Benzo(b)fluoranthene	21/21	0.0017	0.066	SS119	8/14/02	0.62		2.1	
Benzo(ghi)perylene	21/21	0.0014	0.035	SS104/SS119	8/14/02				
Benzo(k)fluoranthene	20/21	0.00081	0.06	SS119	8/14/02	6.2		21	
Chrysene	21/21	0.0014	0.079	SS119	8/14/02	62		210	
Dibenzo(a,h)anthracene	19/21	0.00033	0.0095	SS119	8/14/02	0.062		0.21	
Fluoranthene	21/21	0.0019	0.14	SS119	8/14/02	2300		22000	
Fluorene	19/21	0.00021	0.0066	SS119	8/14/02	2700		26000	
Indeno(1,2,3-c,d)pyrene	21/21	0.0014	0.039	SS119	8/14/02	0.62		2.1	
Naphthalene	21/21	0.00057	0.0064	SS106	8/14/02	56		190	
Pentachlorophenol (PCP)	5/21	0.0028	0.022	SS104	8/14/02	3		9	
Phenanthrene	21/21	0.0012	0.09	SS110	8/14/02				
Pyrene	21/21	0.0013	0.14	SS110	8/14/02	2300		29000	
Tetrachlorophenols, Total	0/21	na	na						
Total PAHs (calculated)	21/21	0.01299	0.774	SS119	8/14/02				
Dioxins/Furans (pg/g)									
2,3,7,8-Tetrachlorodibenzo-p-dioxin	7/21	0.225	0.033041	SS109	8/14/02				
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	11/21	0.692	0.003984	SS104	8/14/02				
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	16/21	0.39	0.007801	SS104	8/14/02				

Table 8-7. Summary of Background Soil Results (Continued)

Analyte	Num detected/ Num analyzed	Minimum detected result	Maximum detected result	Location of maximum detected result	Date of maximum detected result	Soil PRG - Residential	Num Greater than Residential PRG	Soil PRG - Industrial	Num Greater than Industrial PRG
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	21/21	0.662	52.998	SS104	8/14/02				
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19/21	0.646	26.552	SS104	8/14/02				
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	21/21	9.076	1293.351	SS104	8/14/02				
Octachlorodibenzo-p-dioxin	21/21	60.087	10851.004	SS104	8/14/02				
2,3,7,8-Tetrachlorodibenzofuran	11/21	0.574	18.945	SS109	8/14/02				
1,2,3,7,8-Pentachlorodibenzofuran	10/21	0.367	1.805	SS104	8/14/02				
2,3,4,7,8-Pentachlorodibenzofuran	12/21	0.503	2.3	SS104	8/14/02				
1,2,3,4,7,8-Hexachlorodibenzofuran	17/21	0.359	6.547	SS104	8/14/02				
1,2,3,6,7,8-Hexachlorodibenzofuran	17/21	0.276	4.79	SS104	8/14/02				
1,2,3,7,8,9-Hexachlorodibenzofuran	2/21	0.353	1.21	SS102	8/9/02				
2,3,4,6,7,8-Hexachlorodibenzofuran	17/21	0.541	7.833	SS104	8/14/02				
1,2,3,4,6,7,8-Heptachlorodibenzofuran	21/21	1.779	114.206	SS104	8/14/02				
1,2,3,4,7,8,9-Heptachlorodibenzofuran	8/21	0.931	6.964	SS104	8/14/02				
Octachlorodibenzofuran	21/21	5.234	248.061	SS104	8/14/02				
Total TCDD	21/21	0.555	51.161	SS109	8/14/02				
Total PeCDD	21/21	1.276	38.124	SS104	8/14/02				
Total HxCDD	21/21	7.674	397.017	SS104	8/14/02				
Total HpCDD	21/21	19.645	2459.208	SS104	8/14/02				
Total TCDF	20/21	0.93	189.89	SS109	8/14/02				
Total PeCDF	21/21	1.302	154.426	SS109	8/14/02				
Total HxCDF	21/21	1.453	191.348	SS101	8/9/02				
Total HpCDF	21/21	4.22	347.374	SS101	8/9/02				
2,3,7,8-TCDD equivalent (TEQ-WHO)	21/21	0.0967687	36.652934	SS109	8/14/02	3.9	6	27	1

Notes:

PAH - polyaromatic hydrocarbons

PRG - EPA Region IX Preliminary Remediation Goal

Total PAH is the calculated sum of detected PAHs, exclusive of 2-methynaphthalene

Total TEQ (WHO 1998) was calculated using detected PCDD/PCDF results